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APPLICATION OF GEOSTATISTICAL METHODS AND WAVELETS TO THE ANALYSIS OF HYPERSPECTRAL IMAGERY AND THE TESTING OF A MOVING VARIOGRAM

First Interim Report (RSSUSA - **5/1)**

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13. ABSTRACT (Maximum 200 words)

This first report of the project. It incorporates the report on an analysis completed in the previous project on moving averages, variances and variograms for NIR from a SPOT image of part of Fort A. P. Hill. In addition the computer programs for these are included. The maps of the variances and the diagram of the variograms show areas of the image that are not stationary and where kriging is likely to perform less well in prediction than wavelet analysis. The second part of the reports summarises Dr Oliver's visit to the Topographic Engineering Center in June 2000. The third section comprises work on a part of the image analysed previously, called 'aphillcut' to distinguish it from the larger section of image used. This work has explored in detail any relation between elevation from a digital elevation model, the raw elevation data and NIR and NDVI. The correlations are weak in spite of the visual relation. The strongest relation was between the moving averages for NDVI and elevation for a window of 10 × 10 pixels. The final section describes the initial work that has been done on the hyperspectral 'hymap' data. This is principally a correlation analysis and principal component analysis.

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Introduction

This is the first report of the current project. It contains several sections of work. The analysis and computer programs for the first part of the report on the moving averages, variances and variograms were completed in the previous project. There was insufficient time, however, to complete the written part of this work. The complete section is now included although files of the results and computer programs had been sent to TEC in digital form. Four days of the present contract were spent working at the Topographic Engineering Center and one day at the Virginia Institute of Marine Science. In addition time has been spent on the wavelets and kriging paper for submission to the Proceedings of the Sixth International Geostatistics Congress. This paper can only be accessed on CD-Rom at present, the published proceedings will come out in 2001. The rest of this report will comprise work done on the image and digital elevation model for Fort A. P. Hill, and on the latest hyperspectral imagery.

Moving variance and tiled variograms

Richard Webster and Margaret A. Oliver

The computation of a variogram for a region carries with it the implication that the underlying variation is stationary in the intrinsic sense. The analyst assumes that the expected differences between places, at least for small lag distances, are zero and that the expected squared differences are constant for any given lag:

$$\mathrm{E}[Z(\mathbf{x}) - Z(\mathbf{x}+\mathbf{h})] = 0 \qquad (1)$$

and

$$\mathrm{E}[\{Z(\mathbf{x}) - Z(\mathbf{x}+\mathbf{h})\}^2] = 2\gamma(\mathbf{h}). \qquad (2)$$

Here, in the usual geostatistical convention, $Z(\mathbf{x})$ and $Z(\mathbf{x}+\mathbf{h})$ are the values of the random variable Z at positions $\mathbf{x}$ and $\mathbf{x}+\mathbf{h}$, where $\mathbf{h}$ is the lag, and $\gamma(\mathbf{h})$ is the semivariance at that lag.

The equations above refer to the random process $Z(\mathbf{x})$, and in any one realization the actual values depart from its expectation. Geostatisticians are used to this and accept Equation (1) without demur

in many instances. Equation (2) is assumed to hold everywhere; i.e. the semivariance depends on the lag only and not on the position. Geostatisticians are used to this too; usually they have too few data to explore its validity. Remote images from satellites, each comprising several hundred thousand pixels, however, may cause us to question the assumption when some parts of an image are plainly more variable than others. The SPOT image of AP Hill is one such; Figure 1, a pixel map of NIR, is an example. This is the part of A. P. Hill that we examined originally. With so many data we can examine the changes in the variogram over the region, and the result can help us to decide whether our assumption of stationarity is reasonable.

Analysis

We computed three sets of criteria to evaluate the likely stationarity; the moving average, the moving variance, and the local variogram. The first two are defined as follows.

Moving average. This is computed by placing over the image a window containing n pixels and summing the values of NIR within the window:

$$\bar{z}(\mathbf{x}_c) = \frac{1}{n}\sum_{i=1}^{n} z(\mathbf{x}_i). \qquad (3)$$

where $z(\mathbf{x}_i)$ is the value of the ith pixel in the window, and $\mathbf{x}_c$ denotes the centre of the pixel. The window is moved one pixel at a time, and at each new position $\bar{z}(\mathbf{x}_c)$ is computed. In this way a map of moving averages is built.

Moving variance. The moving variance, ($\sigma^2(\mathbf{x}_c)$, is computed in an analogous way from

$$\sigma^2(\mathbf{x}_c) = \frac{1}{n-1}\sum_{i=1}^{n} \{z(\mathbf{x}_i) - \bar{z}(\mathbf{x}_c)\}^2. \qquad (4)$$

Again, a map of the local variances can be made.

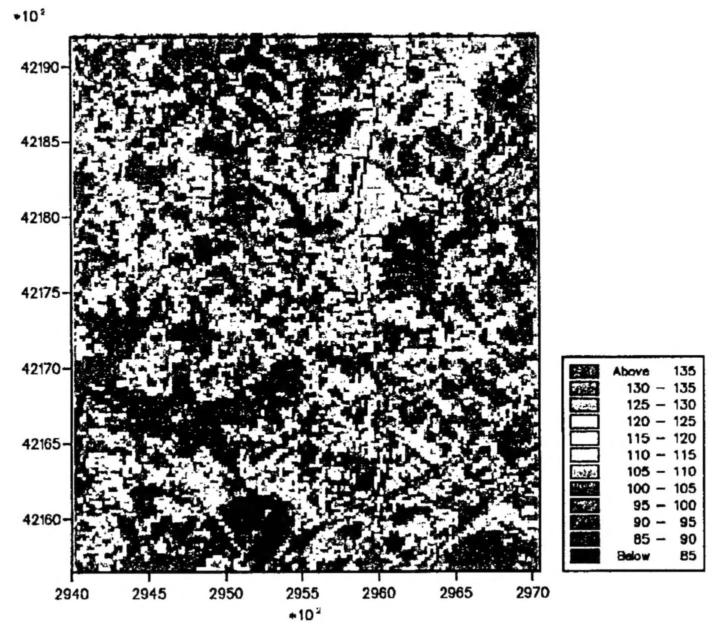


Figure 1. Pixel map for NIR of the original part of the SPOT image studied for A. P Hill. The co-ordinates are given as UTMs.

Local variogram. Semivariances can be calculated for a window from

$$\gamma(\mathbf{h}_c) = \frac{1}{2m(\mathbf{h})} \sum_{j=1}^{m(\mathbf{h})} \{z(\mathbf{x}_j) - z(\mathbf{x}_j + \mathbf{h})\}^2, \qquad (5)$$

where the index j refers to those pixels for which a paired comparison is possible at the particular lag $\mathbf{h}$, and $m(\mathbf{h})$ is the number of such comparisons.

Computing local variograms for the same windows as for the average and variance runs into some difficulties.

1. Experimental variograms are unreliable with fewer than about 100 data. So it has seemed unreasonable to attempt to compute them for small windows, i.e. less than 10×10.

2. They are time-consuming, though not so time-consuming as to make the task impossible on a modern workstation.

3. Displaying the hundreds of thousands of variograms is fraught.

So, instead of moving the window one pixel at a time we divided the image into square tiles without any overlap. Also, to provide an intelligible display we chose tiles of $15 \times 15 = 225$ pixels. From experience we know that this size of sample estimates the local variogram well. We then computed the variogram to a maximum lag of 12.5 pixels.

Results

We computed the moving averages and moving variances for square windows of sides 3, 5, 7, 9, 11, and 15 pixels. The results are displayed in Figures 2 to 7. In Figure 2 (3×3 window) the features in the original image, Figure1 are still visible. For example the lakes in the north and centre (blue areas) and the line of the road running N-S (green). The latter is not as evident as in

Figure 1. In Figure 3 (5 × 5 window) the lakes are still evident, but the outline is no longer distinct and the line of the road is barely visible. As the window widens further, Figures 4 to 7, the coarse features of the image become increasingly apparent. The map for the window of 9 × 9 pixels is very similar to that for the long-range structure from factorial kriging (see previous final report). There is little evidence of non-stationarity.

The margins of the maps, which broaden as the window increases in size, are the global average. This value is given when the window dimensions cannot be fitted due to edge effects.

Analogous maps of the moving variances are shown in Figures 8 to 13. These tell a different story. The smallest window, 3 × 3 = 9 pixels, shows local, mostly sinuous, patches of image where the variance is much larger than the general background, Figure 8. In particular the variances are large at the margins of the lakes, and their shape is evident. Increasing the window to 25 pixels leaves a basically sinuous pattern, but with the patches of large variance beginning to broaden, Figure 9. This broadening continues as the window is enlarged, and the sinuosity has almost disappeared and is confined to patches of medium variation with the window of 81 pixels. The patches of large variance appear as blobs, as they do with the wider windows. As for the maps of the moving averages, the uniform bands at the margins are of the global variance.

Figure 14 shows the variograms in their corresponding tiles, and so is effectively a map. In each tile the experimental variogram appears as the set of points, the left-most of which is at the origin and the right-most at a lag of 12.5 pixels is scaled so that it lies near the right hand margin of the tile. The ordinates are scaled in the range 0 to 20 000 NIR^2. The horizontal line through the points is the local variance of the data. The full image is 151 pixels (columns) 178 (rows). The width of the tiles, 15 pixels, will not divide exactly into either, and so there are gaps at the right and top of the image.

Over most of the image the local variance is small, and it is difficult to see what autocorrelation there is. In a relatively few squares, however, the variance is evidently strongly structured. These squares also happen to be the ones with the largest variances, and perhaps it is because they have the large variances that it is possible to display the results in an informative way.

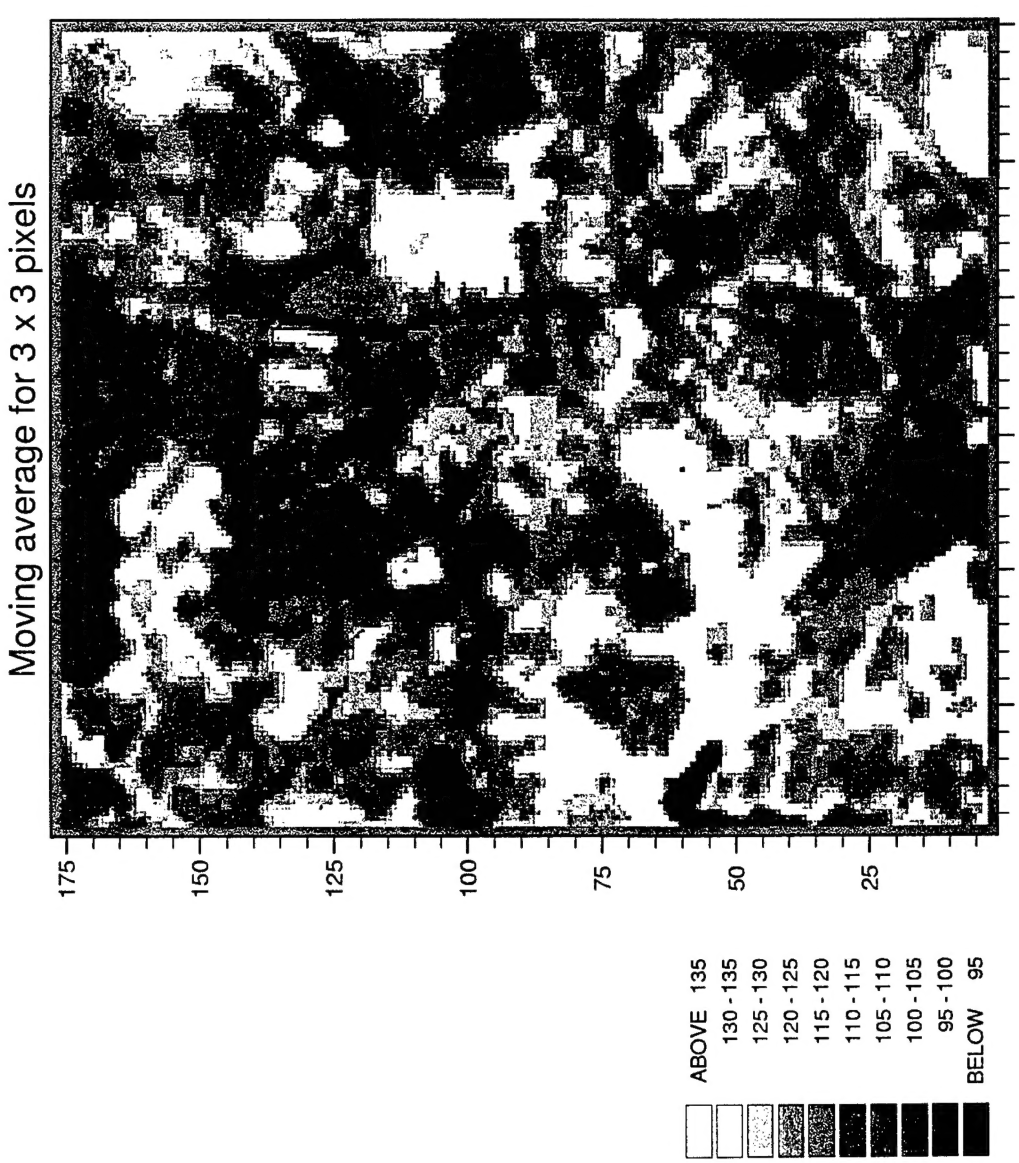


Figure 2. Pixel map of the moving averages for NIR computed from a square window of 3 × 3 pixels.

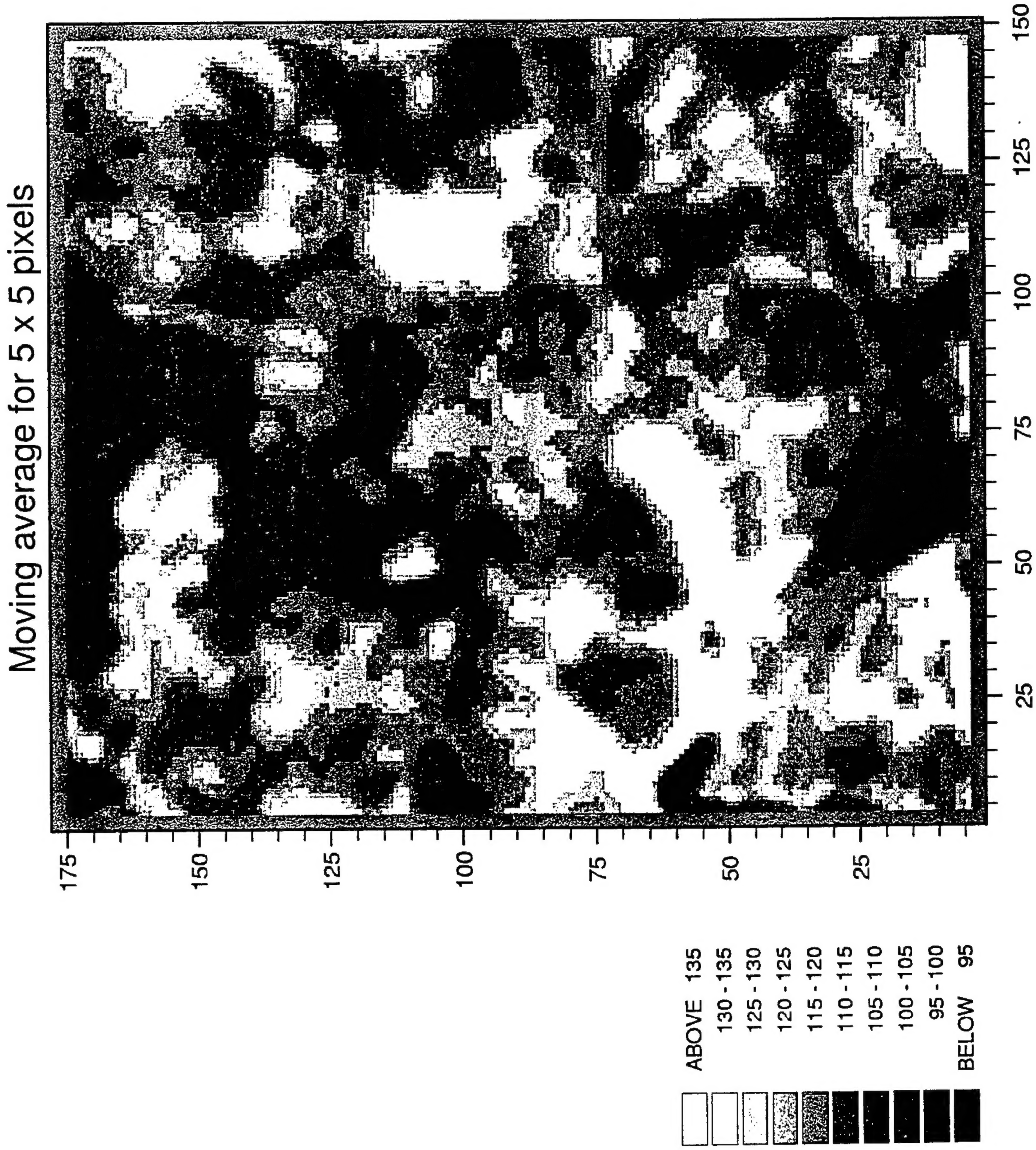


Figure 3. Pixel map of the moving averages for NIR computed from a square window of 5 × 5 pixels.

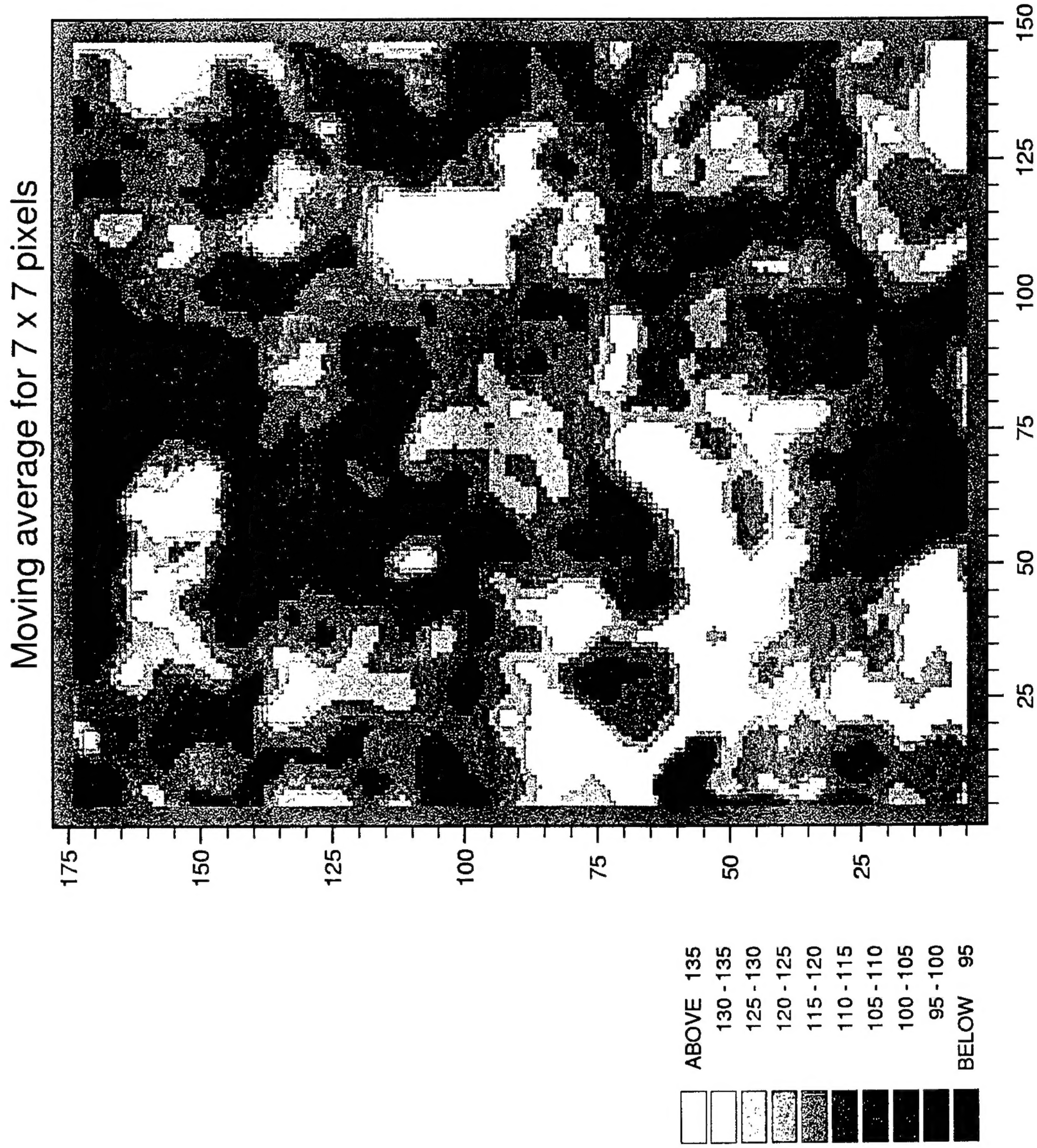


Figure 4. Pixel map of the moving averages for NIR computed from a square window of 7 × 7 pixels.

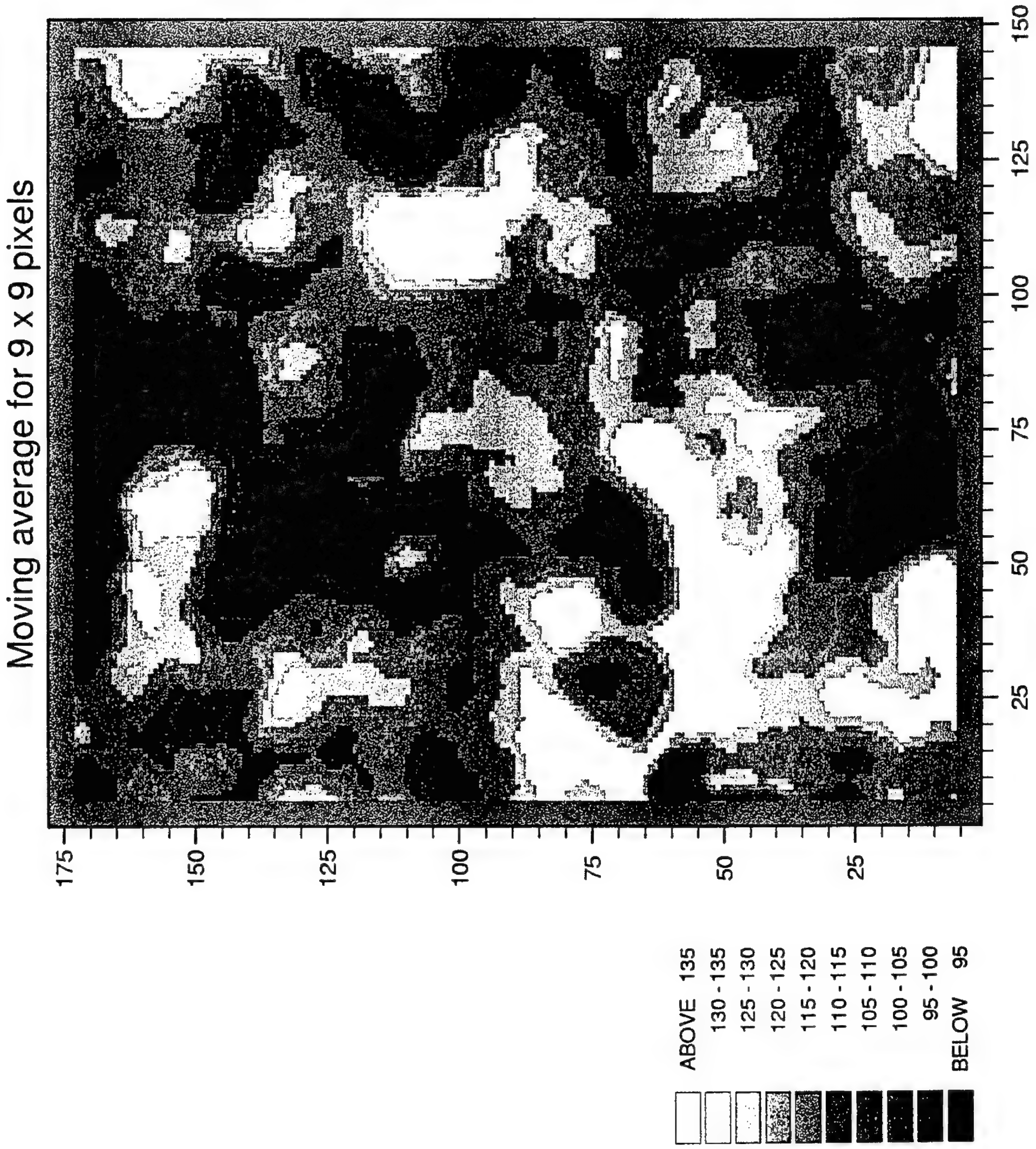


Figure 5. Pixel map of the moving averages for NIR computed from a square window of 9 × 9 pixels.

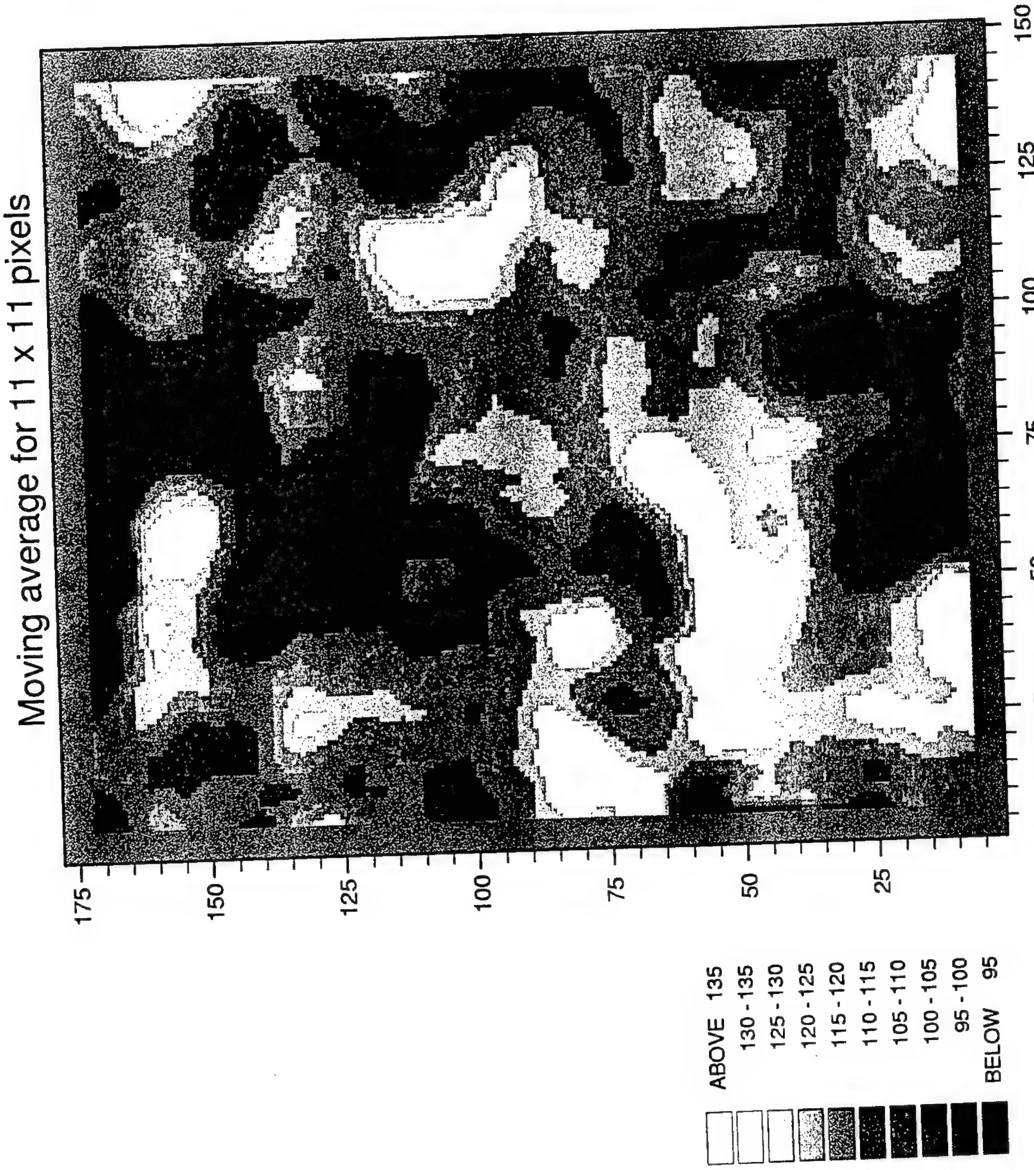


Figure 6. Pixel map of the moving averages for NIR computed from a square window of 11 × 11 pixels.

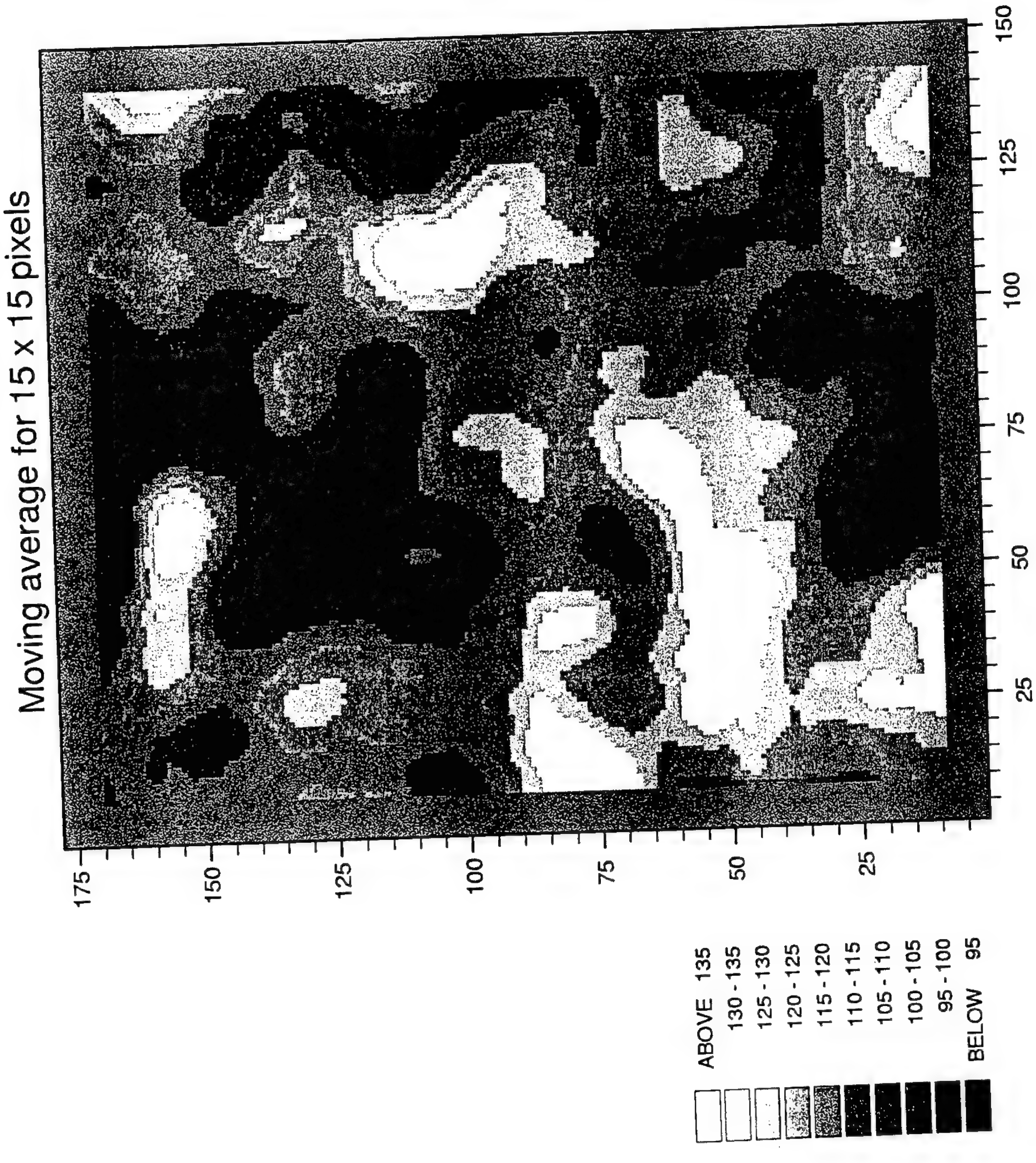


Figure 7. Pixel map of the moving averages for NIR computed from a square window of 15 × 15 pixels.

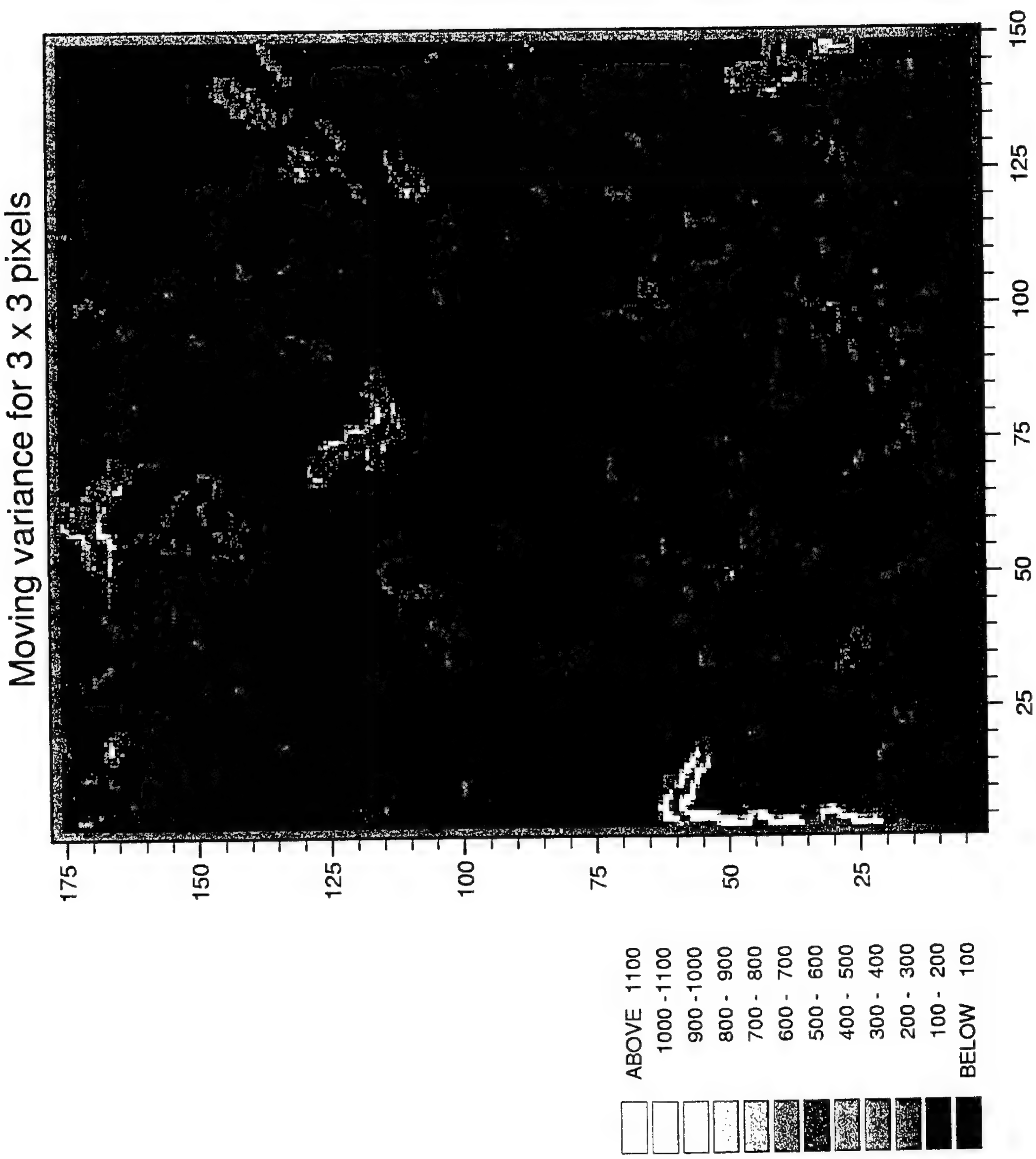


Figure 8. Pixel map of the moving variances for NIR computed from a square window of 3 × 3 pixels.

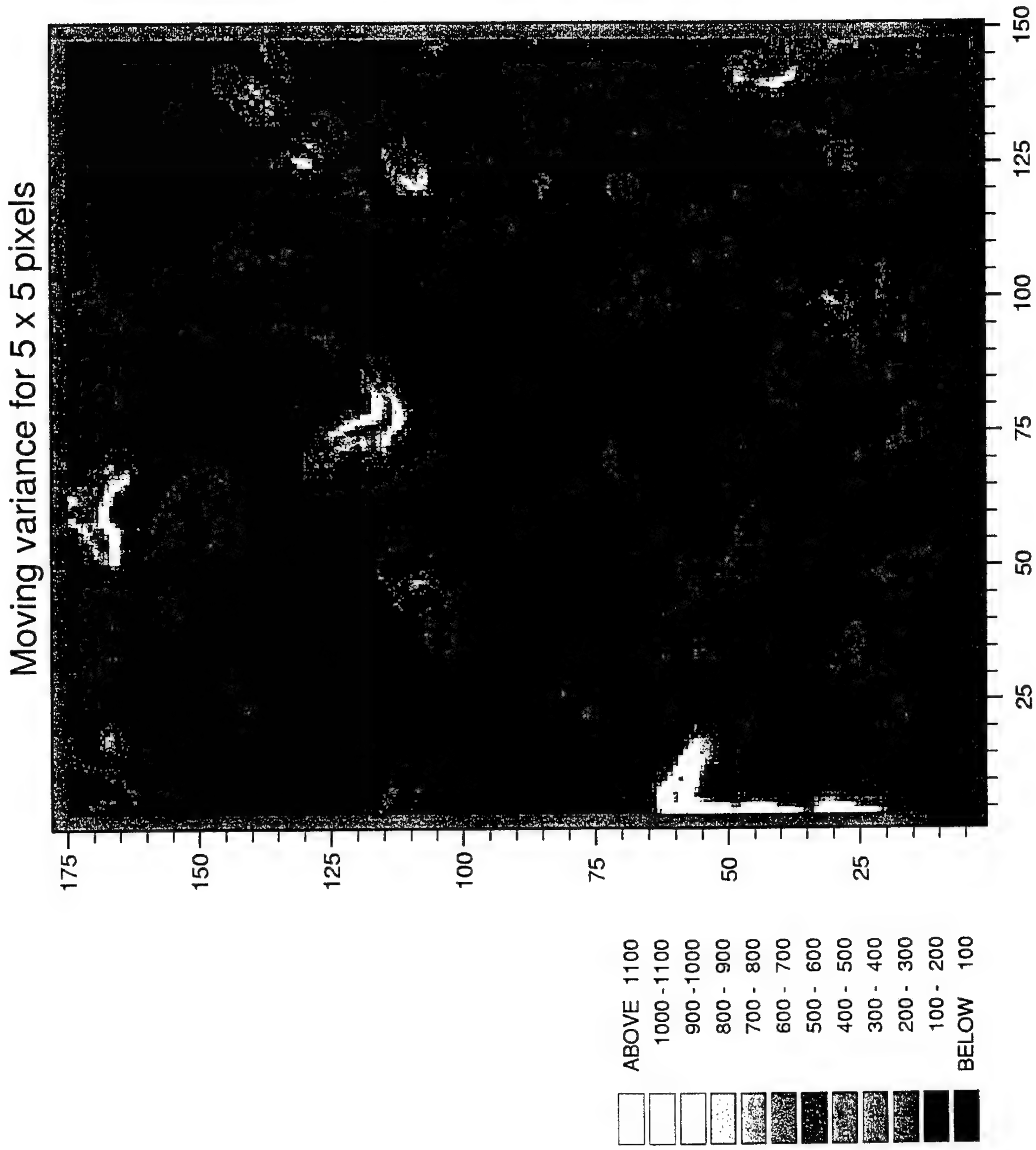


Figure 9. Pixel map of the moving variances for NIR computed from a square window of 5 × 5 pixels.

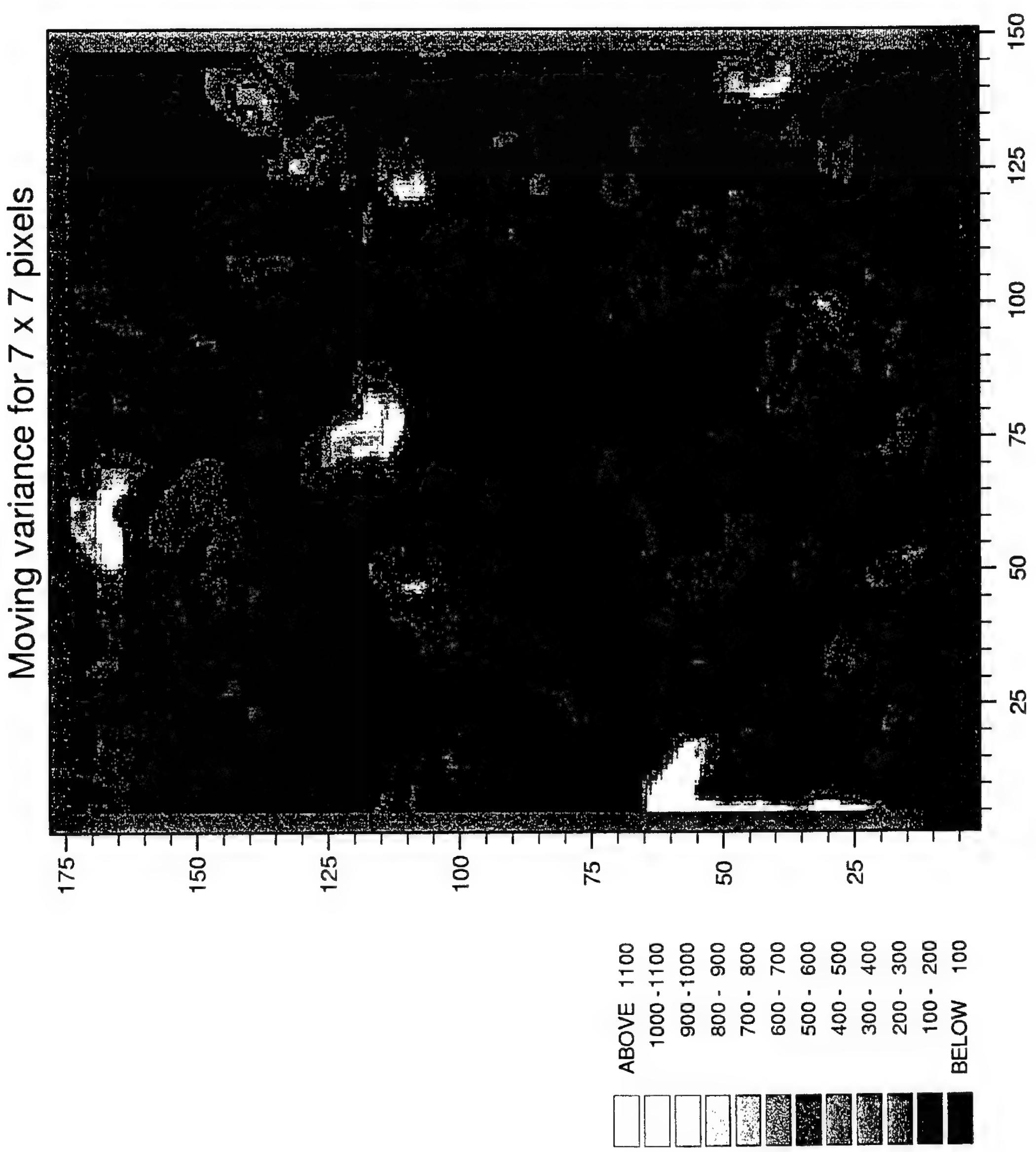


Figure 10. Pixel map of the moving variances for NIR computed from a square window of 7 × 7 pixels.

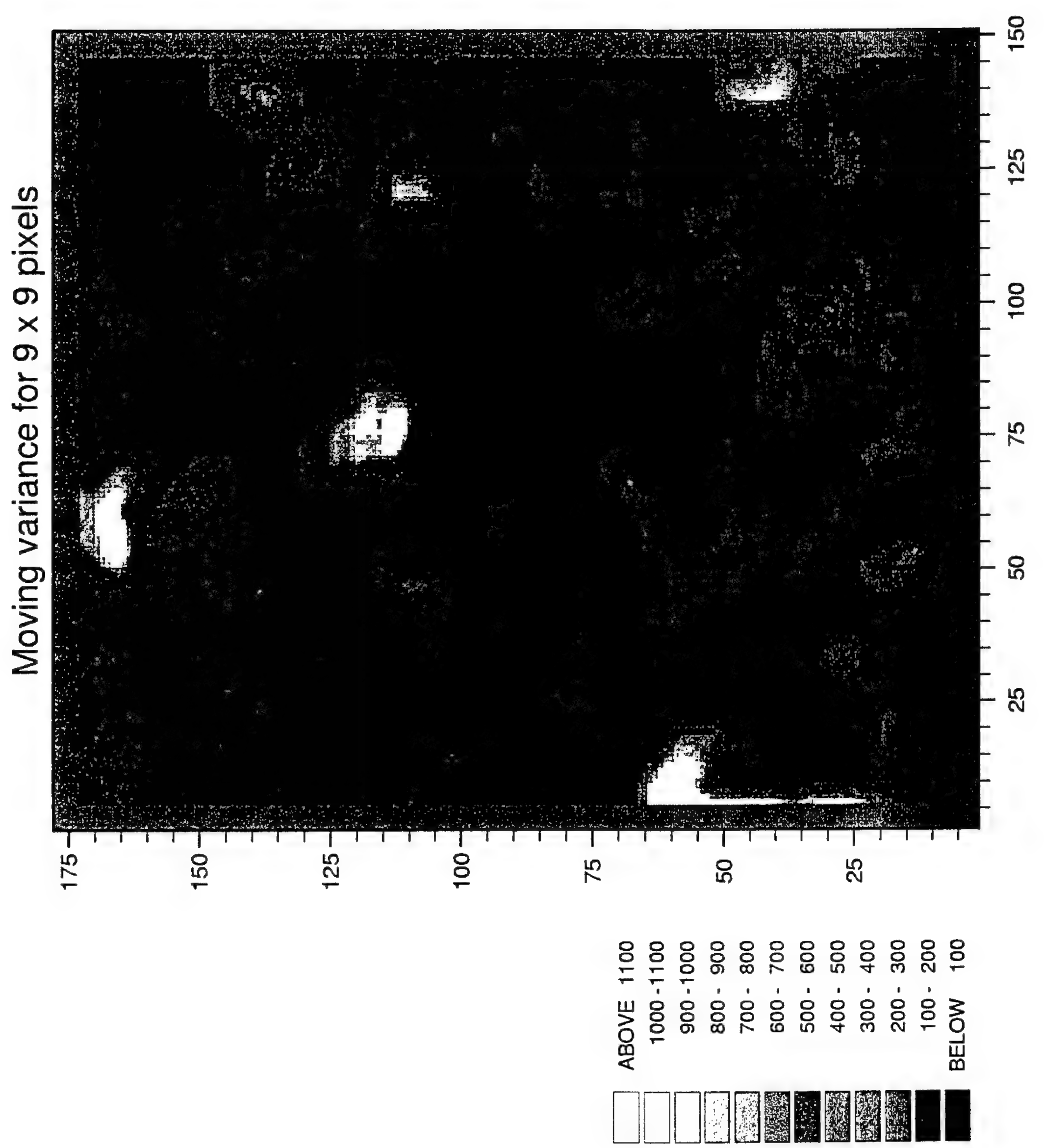


Figure 11. Pixel map of the moving variances for NIR computed from a square window of 9 × 9 pixels.

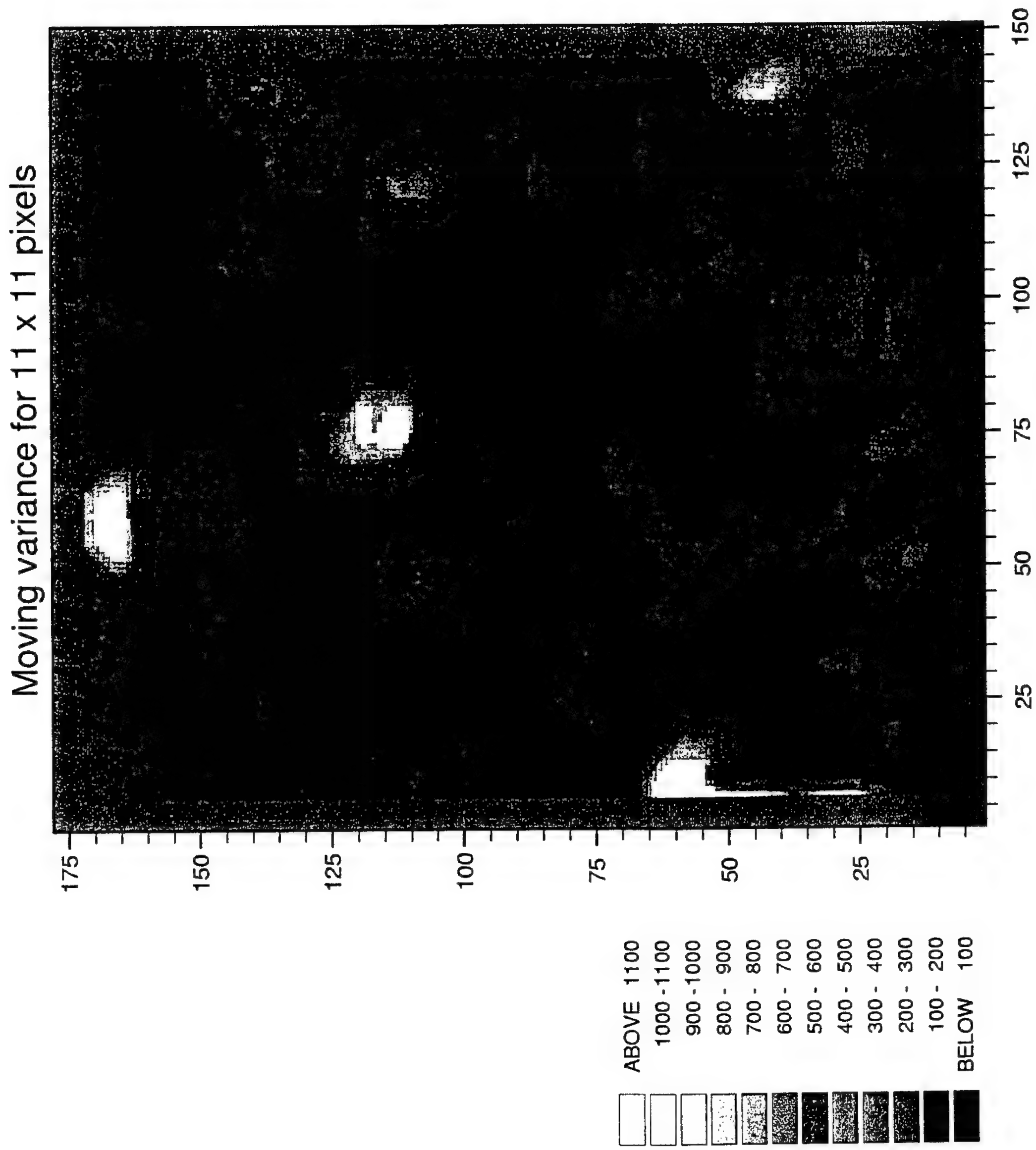


Figure 12. Pixel map of the moving variances for NIR computed from a square window of 11 × 11 pixels.

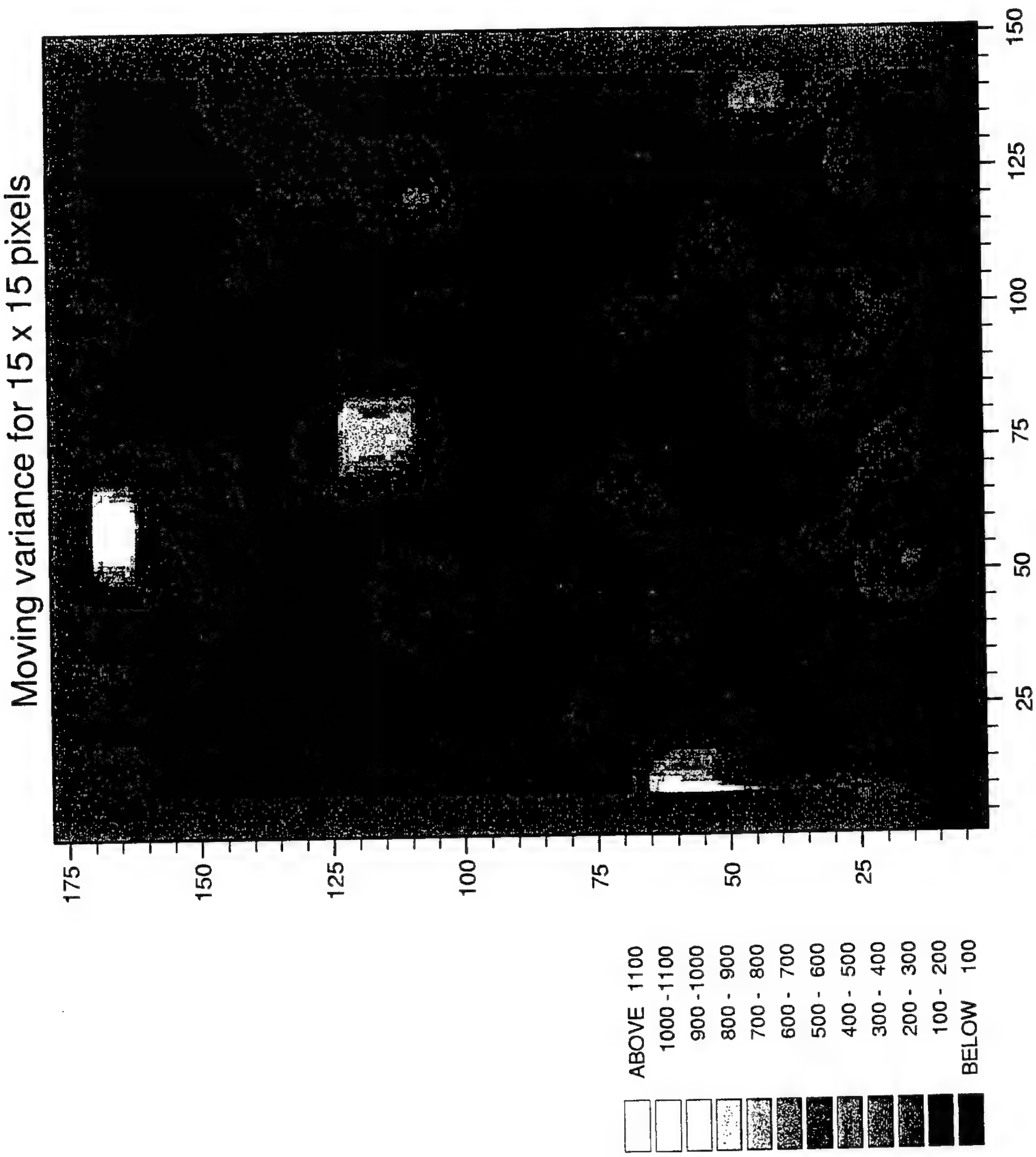


Figure 13. Pixel map of the moving variances for NIR computed from a square window of 15 × 15 pixels.

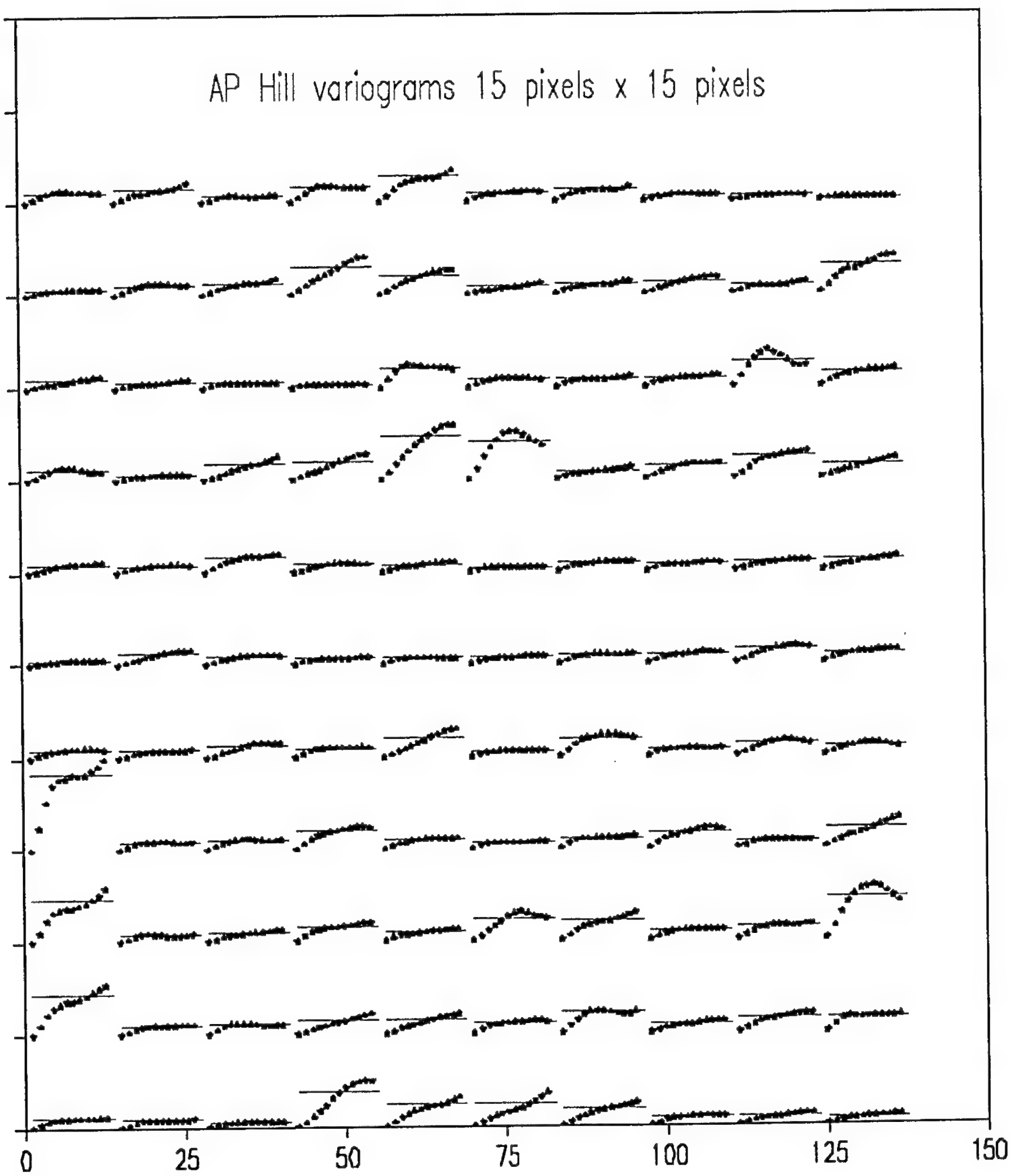


Figure 14. Mosaic of variograms that correspond to the square windows of 15 × 15 pixels.

Conclusions

The maps of moving average show increasingly clearly the coarse features of the image as the moving window is widened. There is little evidence of trend and none sufficient to suggest that the generating process is non-stationary. The maps of moving variance, however, reveal small patches where the variation is much larger than over most of the image. They suggest that the process is not stationary locally in the variance and that the intrinsic hypothesis should not be assumed.

The steeply sloping local variograms confirm this view. It was precisely in these areas of local non-stationarity that the wavelet analysis performed better than kriging in the data reconstruction (Oliver *et al.* 2000). One thing that we shall try later in this project is to use a moving variogram for kriging to compare with the wavelet results.

Report on Visit by Dr Oliver to TEC June 14-21 2000

Margaret A. Oliver

Part of the first morning was spent with Mr J. Shine and Mr E. Bosch discussing how the time should be spent during the visit. Several things were achieved at TEC during the four and a half days that I was there.

1) Mr Shine and I started work again on a short paper for the International Journal of Remote Sensing. This is now almost complete and needs the final conclusions to be added. The figures are almost complete; there is still one variogram that needs to be computed and modelled. This paper will be ready to be sent to the Journal in October when Mr Shine visits England and we can finalise its contents.

2) In addition I went through various Genstat routines with Mr Shine. In trying to krige part of an image the program gave us an error message about the grid size. Since my return to England I have contacted Rothamsted Experimrntal Station where Genstat is developed and I was told that this has been resolved in the new version of the product which TEC is shortly to receive when the license is renewed.

3) In discussing the results of comparing the digital elevation model with the image data I discovered that the original data for elevation were available without having been smoothed by some form of interpolation. We extracted those using Imagine with some help for the area where we have been working. These data have now been re-analysed, but there is little improvement in the correlations.

4) Jim Shine and I were fortunate enough to have a meeting with Colonel Jack Marin from West Point. He showed us some ways of dealing with hyperspectral imagery using neural networks. We have started to analyse the 'hymap' data and we hope that the variogram will identify bands that describe different ground textures.

5) Mr E. Bosch and I worked on the soil data from England and Wales. He has done a wavelet analysis of a selected part of the data in the central part of the country. I did the factorial kriging of the same area to compare the wavelet analysis for the multispectral analysis. We shall continue with this work when Mr Bosch visits England in August.

6) I spent one day at the Virginia Institute of Marine Science. Kevin Slocum is registered as a PhD student there and I am one of his PhD committee members. His oral examination took place on June 16th. It was successful and from my perspective interesting. In the afternoon I gave a lecture which included some general geostatistics, but mainly focused on the work that I have been involved in at TEC. I presented the factorial kriging analysis of Fort A.P.Hill and also the latest work on wavelets. The ensuing discussion was lively.

   One outcome of this visit was a request to teach a short geostatistics course there.

Fort A. P. Hill: aphillcut

Margaret A. Oliver and Zoë L. Frogbrook

In the previous final report we examined the digital elevation model for 5-m and 20-m resolutions. Although there appears to be a relation between NIR and elevation visually this was not proved by the correlation coefficients that we computed, which were small. Mr Shine and Dr Oliver selected a section of the image that we had been working on that minimized the areas of hard-standing because we felt that these could be reducing the overall correlation.

Figure 15 a shows pixel map of NIR for the part of the image called aphillcut: it is in the north western part of the original image, Figure1. It is an area of 76 × 83 pixels compared with the 151× 178 pixels of the original image: it is half the area. Figure 15 b shows the pixel map of NDVI (Normalized Vegetation Index). The maps show similar patterns of variation. Variograms were recomputed and modelled for NIR and NDVI, Figure 16a and b, respectively. They show the experimental semivariances as symbols and the solid lines are the fitted models. Table 1 gives the model parameters. They were both fitted best by nested spherical functions, and their distance parameters are very similar: the short-range component is near to 140 m and the long-range one is about 230 m. The latter is shorter than that for the larger image possibly because we have fitted the model to a shorter overall lag distance because the experimental variograms became slightly irregular.

Table 1. Model parameters for selected properties

Variable	Model	Model parameters					
		c_0	c_1	c_2	a_1	a_2	α
Sub-sampled DEM	Stable exponential	0.00	105.7		5.653		1.633
NIR	Double spherical	0.00	115.4	109.1	6.577	10.49	
NDVI	Double spherical	0.00	0.002707	0.002187	6.940	11.72	

Note: c_0 is the nugget variance, c_1 and c_2 the sills of the autocorrelated variance, a_1 and a_2 the range of spatial dependence and α is the exponent parameters for the stable exponential model.

The original digital elevation model for this area was at a 5-m resolution. We sub-sampled this to obtain information at the same resolution as the SPOT image (20-m). At the time that these data

a) b)

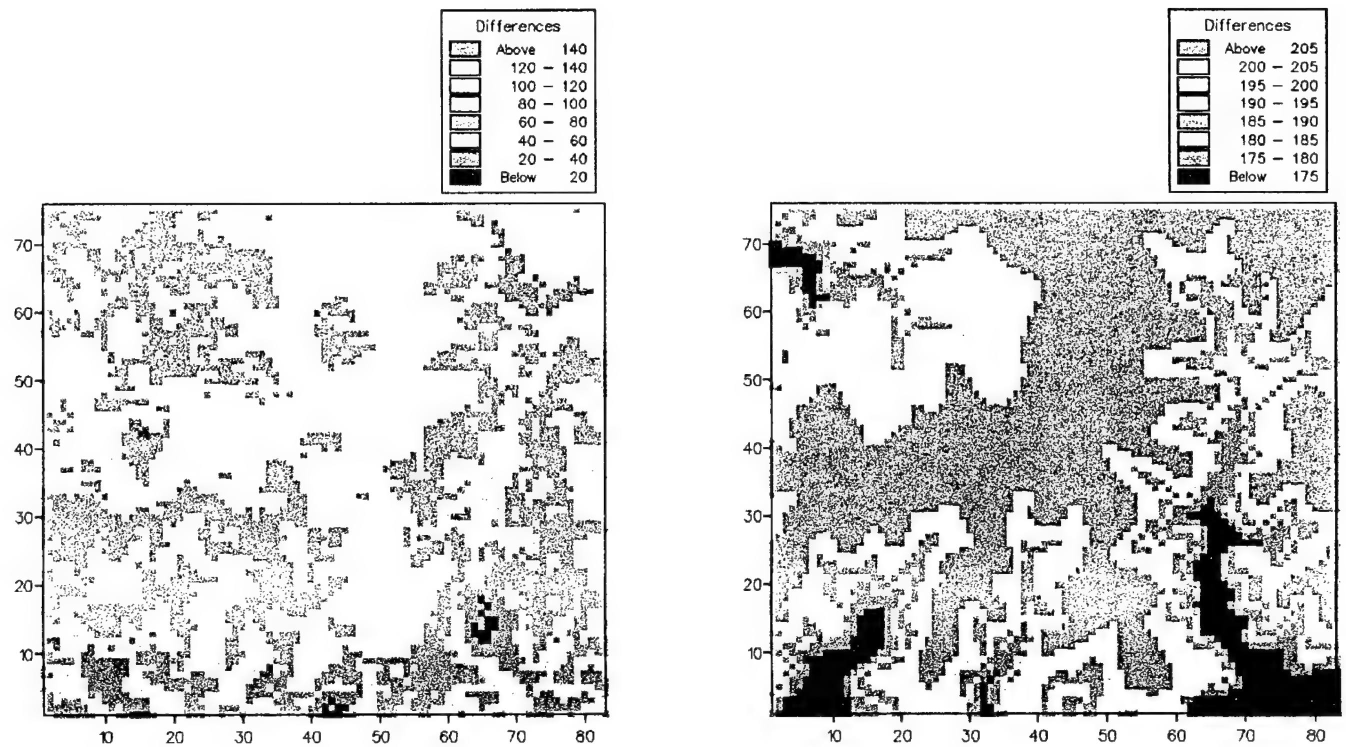
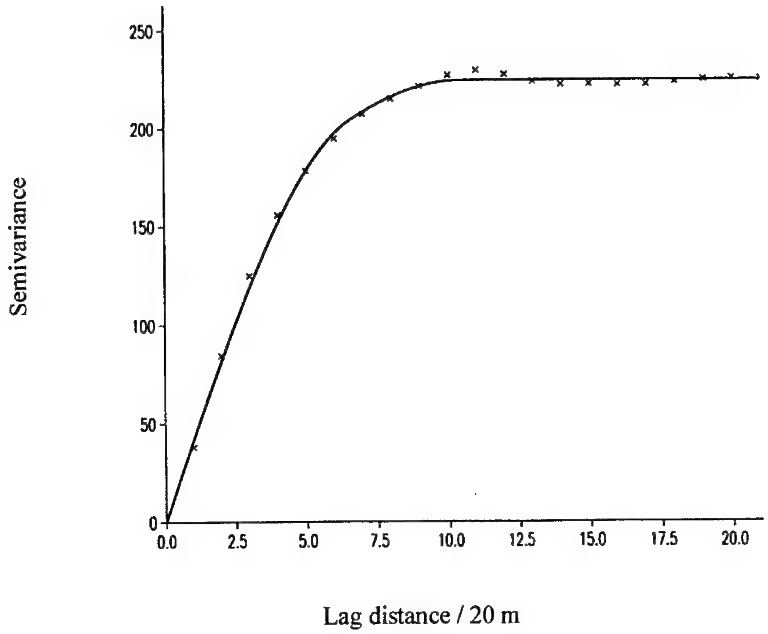


Figure 15. Pixel maps for the part of the SPOT image called 'aphillcut' for a) NIR and b) NDVI.

a)



b)

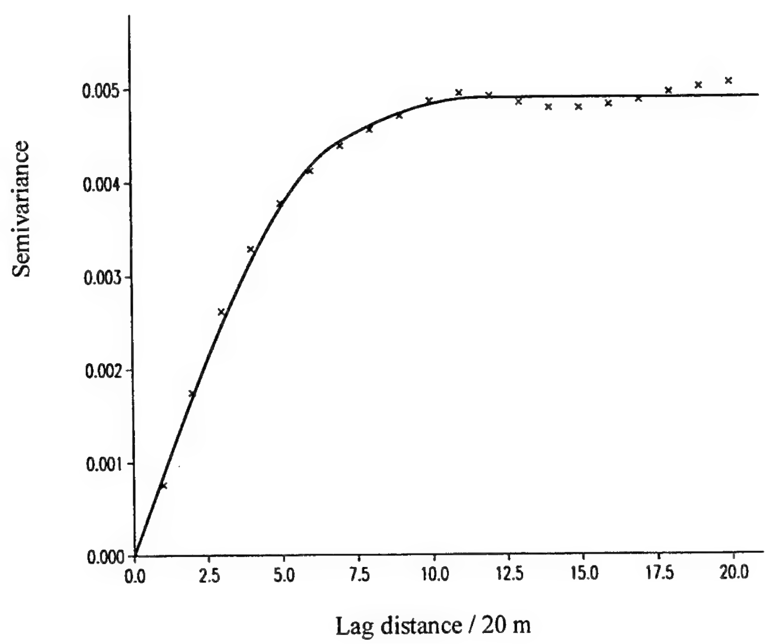


Figure 16. Experimental variograms and fitted model for a) NIR and b) NDVI, using the data from 'aphillcut'.

were analysed we did not know that the DEM comprised interpolated data from 30-m resolution measurements of elevation. Both the 5-m and 20-m data elevation data showed strong trend as for the larger area. The trend was modelled by linear, quadratic and cubic functions fitted to the coordinates. Table 2 shows the proportion of the variance accounted for by the three functions for both data sets. Five transects along rows and columns of the data were selected from the image for a wavelet analysis by E. Bosch. These were also examined for trend. Table 3 gives the percentage variance accounted for by trend. It is clear that the trend is quite variable from place to place.

Table 2. Trend analysis for the original and sub-sampled DEM data.

	% variance accounted for		
	Linear	Quadratic	Cubic
Full DEM data	15.7 %	31.7 %	41.7 %
Sub-sampled DEM*	14.5 %	30.2 %	40.4 %

* DEM data was sub-sampled to match the co-ordinates of the spectral values from the SPOT data.

Table 3. Trend analysis for transects taken from the full DEM data.

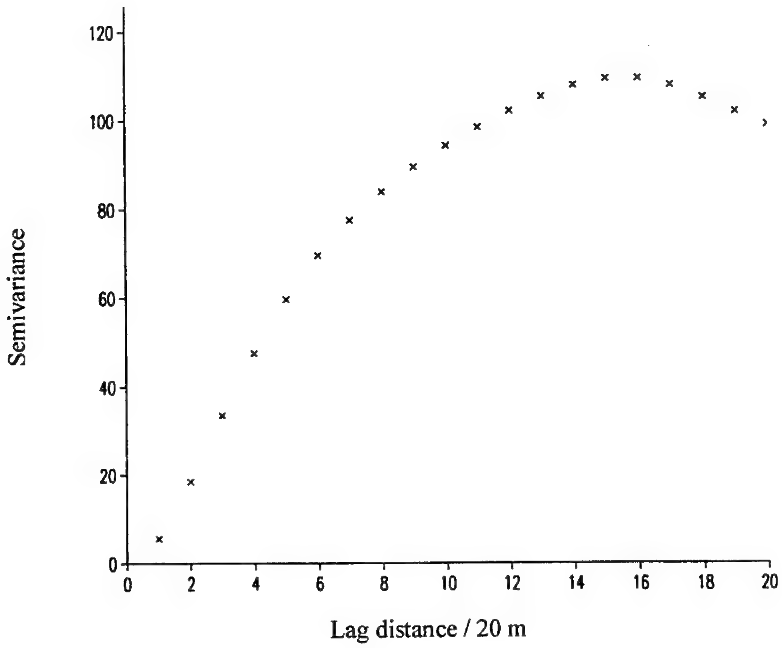
Transect	% of variance accounted for by trend
Transect 1: along y axis	5.8
Transect 2: along y axis	41.5
Transect 3: along x axis	16.5
Transect 4: along x axis	21.3
Transect 5: along y axis	30.1

The variogram was computed for the 20-m elevation data using the residuals from the cubic trend function. Figure 17 a shows the experimental variogram. It is upwardly concave near to the origin and the usual models that we fit were not appropriate. Since we consider the Gaussian model to be unreliable we have fitted a stable exponential function whose equation is given by

$$\gamma(h) = c\left\{1 - \exp\left(-\frac{h^{\alpha}}{r^{\alpha}}\right)\right\}$$

where c is the sill variance, h is the lag and α is an exponent that must be less than 2. Figure 17 b shows the experimental semivariances and the fitted stable exponential model for elevation. Table 1 gives the model parameters. The approximate working range for the exponential function is 340 m.

a)



b)

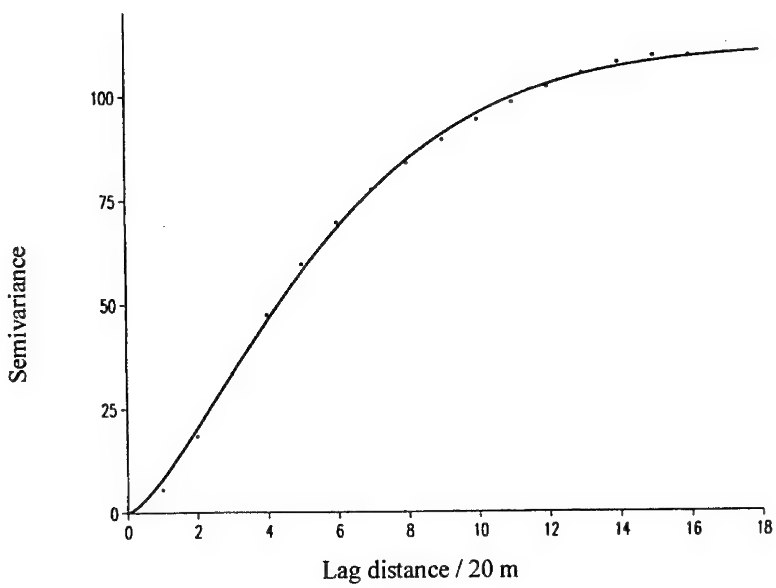


Figure 17. a) Experimental variogram for the elevation data for 'aphillcut', b) the fitted stable exponential model where the exponent was 1.6.

To use this variogram the kriging program had to be amended, as we have not used it before for kriging. Kriging was done on the residuals (for the 20-m data) because the presence of trend violates the assumptions of geostatistics. After kriging the trend was added back to the estimates using the residuals. Figure 18 shows the kriged estimates of elevation for the 'aphillcut' area. A visual inspection of the maps for NIR (Figure 15 a) and Figure 18 shows that the valley systems in the DEM correspond with the large NIR values, while the interfluves have intermediate NIR values.

For the correlation analysis the raw elevation data on a 30 m grid were used, Figure 19. They were compared with coincident pixel information for NIR and NDVI. Figure 20. Table 4 shows that these correlations between the raw data are small. Since we know from experience that local noise in data can sometimes obscure relations between variables we computed the correlation coefficients between the punctually and block kriged estimates and moving averages for the DEM, NIR and NDVI. Figures 21 and 22 show the moving averages for these variables for the 10 by 10 window. The strongest relation, albeit still weak, is between the DEM and NDVI for the moving average computed with a window of 10 × 10 pixels. It is evident that the visual relation between the observed pattern in the image data and the DEM does not appear to be as strong statistically as visually.

Table 4. Correlation coefficients for DEM, NIR and NDVI.

Property 1	Property 2	Correlation coefficient
DEM	NIR	-0.172
DEM	NDVI	-0.175
DEM residuals	NIR	-0.034
DEM residuals	NDVI	-0.042
Block kriged DEM	Block kriged NIR	0.235
Block kriged DEM	Block kriged NDVI	0.219
DEM moving average: block side of 3	NIR moving average: block side of 3	-0.197
DEM moving average: block side of 3	NDVI moving average: block side of 3	-0.203
DEM moving average: block side of 10	NIR moving average: block side of 10	-0.315
DEM moving average: block side of 10	NDVI moving average: block side of 10	-0.330

Summary

The purpose of this detailed investigation between the DEM information and the image data is that if it had been strong it could have been used to restore compressed image information using cokriging. The coregionalization is too weak to exploit in this area, but it might be worth considering elsewhere.

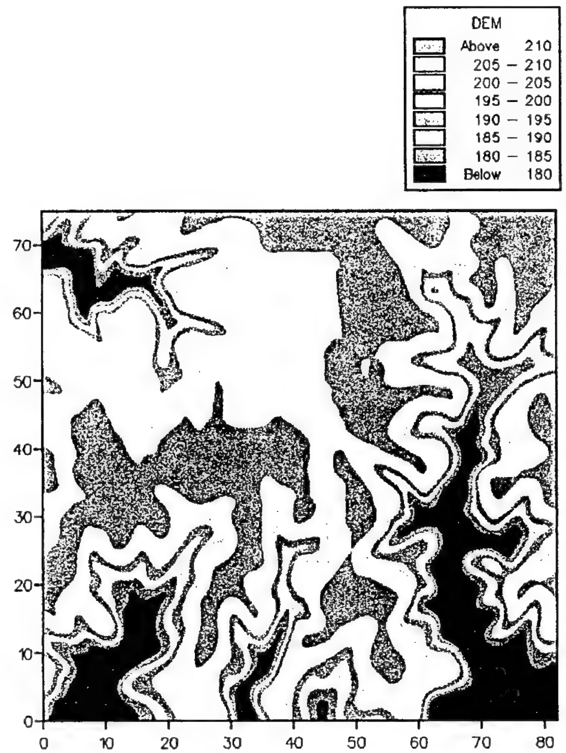


Figure 18. Map of punctually kriged estimates of elevation using the stable exponential model for 'aphillcut'.

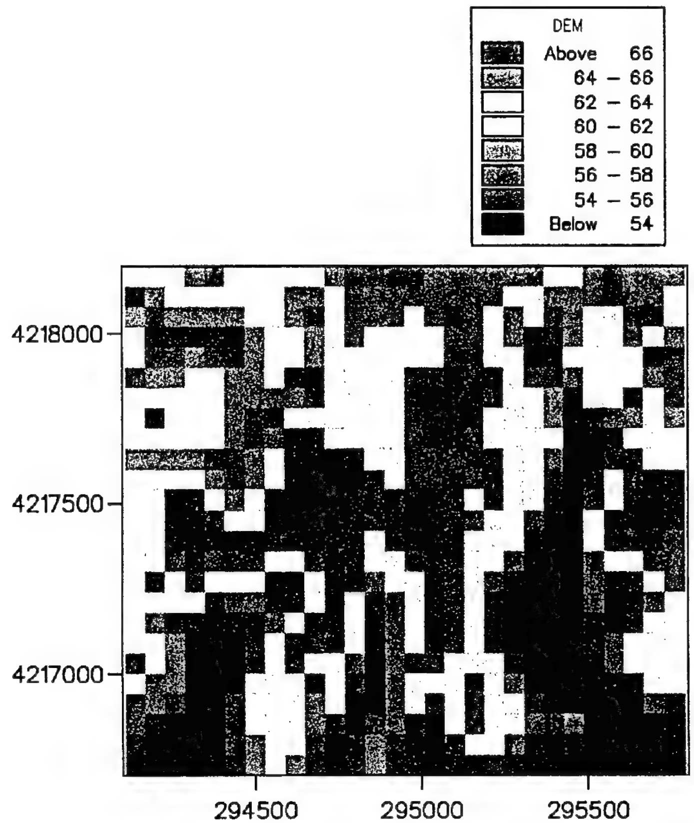


Figure 19. Pixel map of original (raw) elevation values on the 30 m grid for 'aphillcut'.

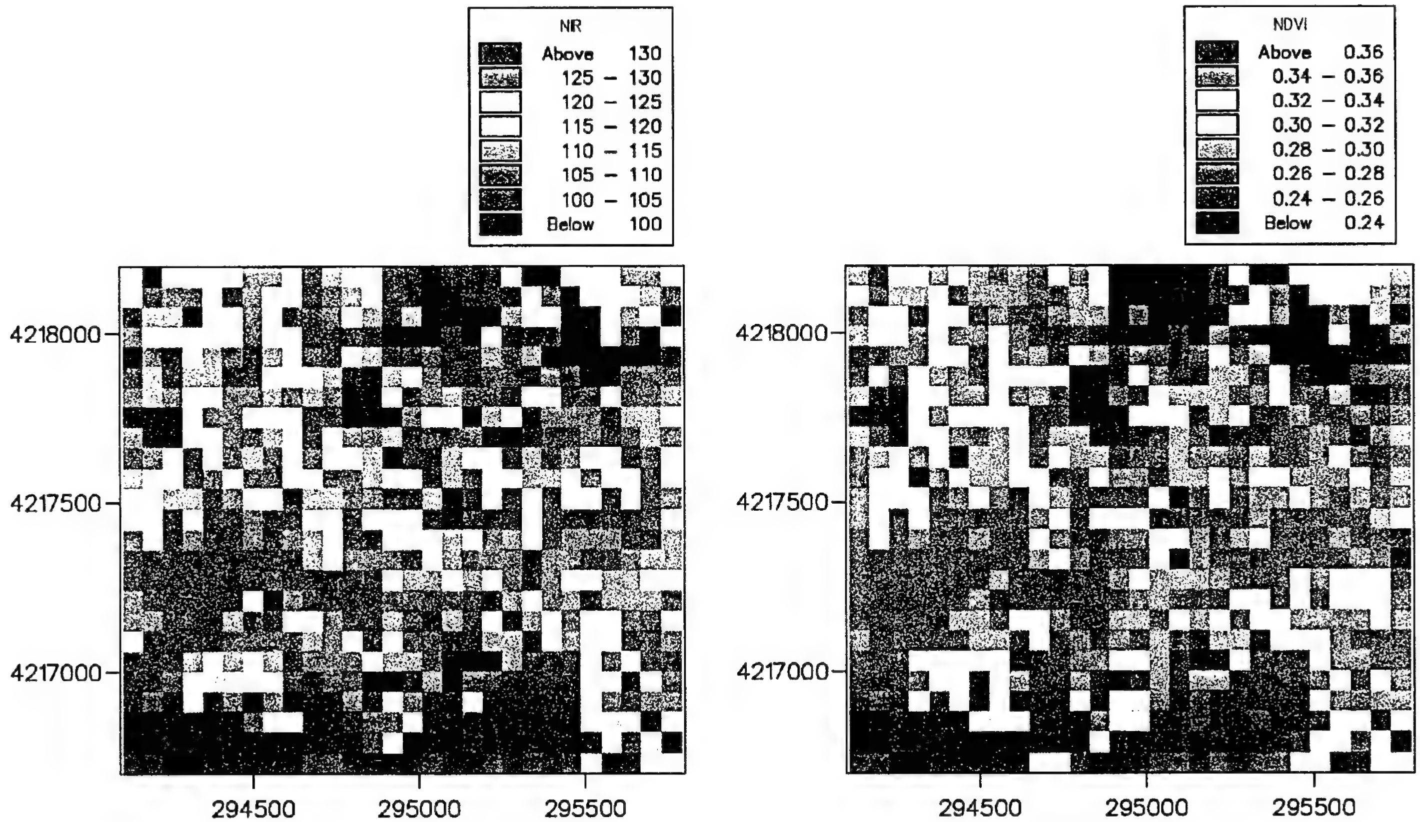


Figure 20. Pixels values of a) NIR and b) NDVI, for SPOT pixels that coincided with the raw elevation values for 'aphillcut'..

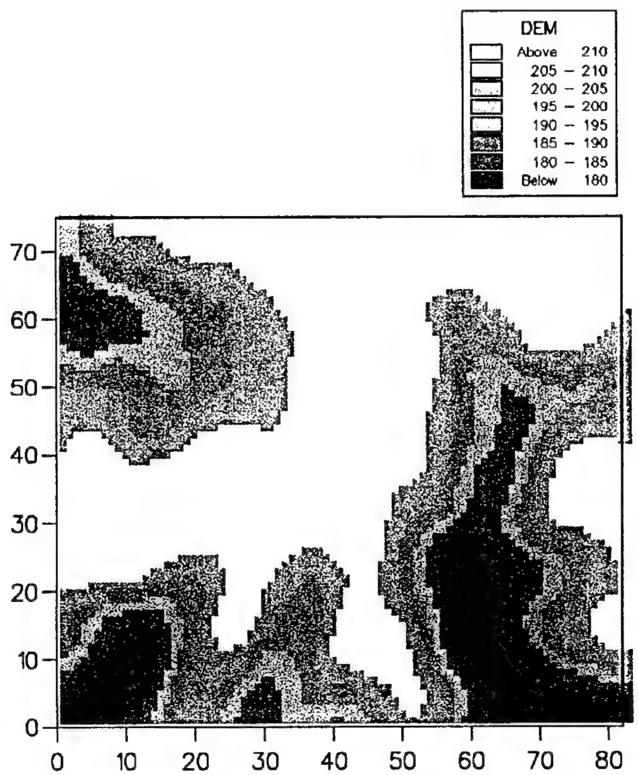


Figure 21. Pixel map of the moving average for a block of 10 × 10 pixels for elevation for 'aphillcut'.

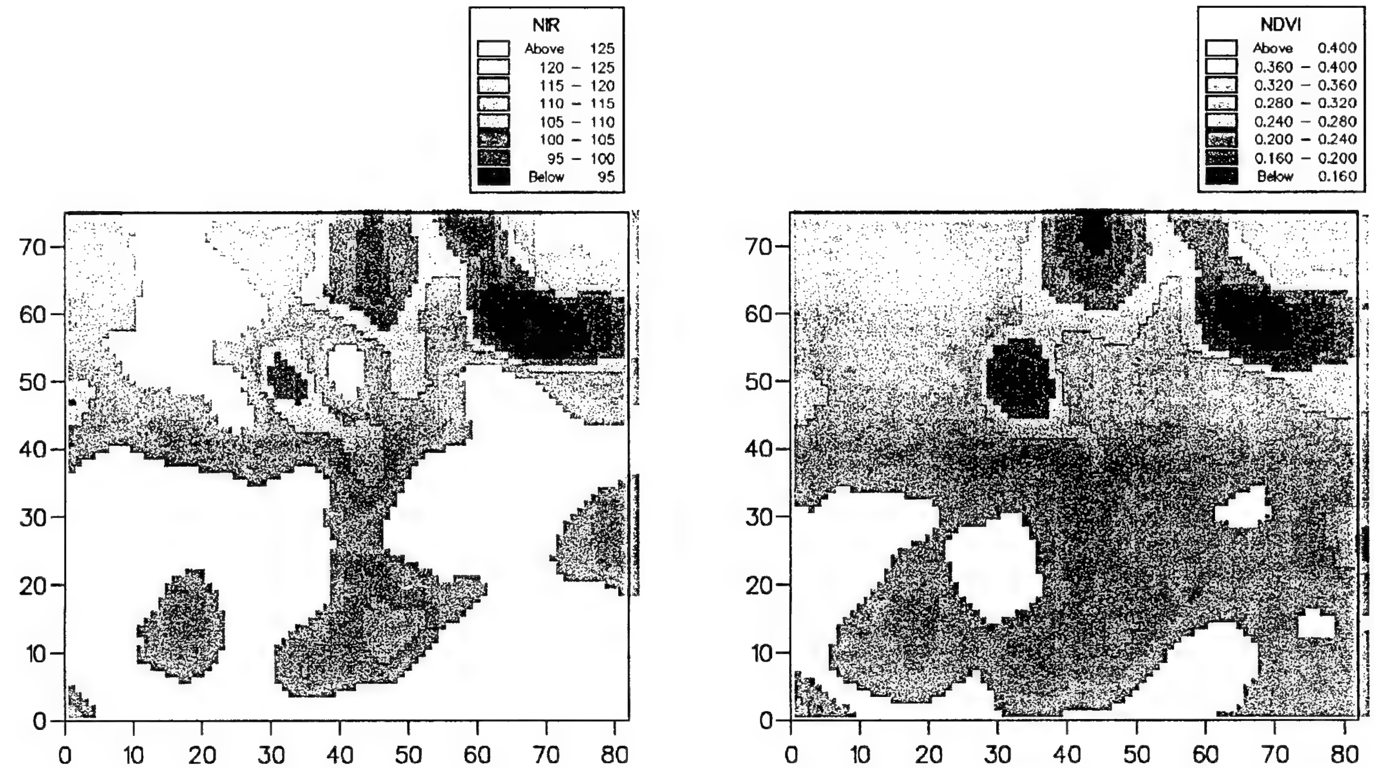


Figure 22. Pixel map of the moving average for a block of 10 × 10 pixels for a) NIR and b) NDVI, for 'aphillcut'.

Hyperspectral imagery

Margaret A. Oliver and Zoë L. Frogbrook

The hyperspectral imagery obtained from the hymap scanner, a commerical hyperspectral sensor, in May. It took some time to extract from the CD as it was in a format we were not familiar with. There are 126 bands that have been separated from the spectrum. The pixel size is 7 m × 7m. Our aim in the analysis is to determine whether the texture expressed by different bands can be identified using the variogram, kriging and factorial kriging if the variograms are nested.

Since the data set is so large we sampled it and retained one pixel in every three. This resulted in a 21-m separation between the pixel centres. Our preliminary variogram analysis of the first 8 bands showed that these all have a similar spatial structure to each other.

Table 5 gives the correlation coefficients between all of the bands and it is evident that the first 36 are strongly correlated. It is likely that these will contain similar spatial information. The remaining bands are moderately to weakly correlated with the first 36 bands, but other groups of wavebands show strong correlation with each other. Do the strongly correlated bands imply that spatially these are mainly redundant and that we can look at one to obtain the information of value? We shall examine some of the strongly correlated bands to assess whether this is so. We shall use the correlation matrix as an aid to selecting bands likely to contain information that is different from others.

Tables 6 and 7give the results of a principal component analysis (PCA). This multivariate analysis is one way of reducing the amount of data that is examined. Here we include only the preliminary analysis. The first two latent roots account for almost 80% of the variation. Variograms were computed from the scores of the first five components, that for PC5 was pure nugget. This root expressed only 1.45% of the variation and contains little or no spatial information. Nested models provided the best fit to the variograms of the first two components and exponential functions fitted PCs 3 and 4 best. The model parameters are given in Table 7. The spatial scales for PCs 3 and 4 are similar; it is the sill variances that are different. For PCs 1 and 2 the latter appears to have larger ranges of spatial dependence for both the long- and short-range components.

Table 5. Correlation matrix for the 126 bands from the hyperspectral image data

Band	b1	b2	b3	b4	b5	b6	b7	b8	b9	b10	b11	b12
b1	1.00											
b2	0.93	1.00										
b3	0.93	1.00	1.00									
b4	0.92	0.99	1.00	1.00								
b5	0.92	0.99	1.00	1.00	1.00							
b6	0.92	0.98	0.99	0.99	1.00	1.00						
b7	0.91	0.95	0.96	0.96	0.97	0.99	1.00					
b8	0.89	0.92	0.93	0.93	0.94	0.97	1.00	1.00				
b9	0.89	0.92	0.93	0.93	0.94	0.97	0.99	1.00	1.00			
b10	0.89	0.94	0.95	0.95	0.96	0.98	0.99	0.99	0.99	1.00		
b11	0.89	0.95	0.96	0.96	0.97	0.98	0.99	0.98	0.98	1.00	1.00	
b12	0.89	0.95	0.96	0.96	0.97	0.98	0.98	0.97	0.97	0.99	1.00	1.00
b13	0.88	0.94	0.95	0.96	0.97	0.98	0.97	0.96	0.96	0.98	0.99	1.00
b14	0.88	0.94	0.95	0.96	0.97	0.97	0.96	0.94	0.95	0.98	0.99	1.00
b15	0.87	0.94	0.95	0.96	0.97	0.97	0.95	0.93	0.94	0.97	0.98	0.99
b16	0.86	0.94	0.95	0.96	0.96	0.96	0.94	0.91	0.92	0.95	0.97	0.98
b17	0.86	0.93	0.94	0.95	0.96	0.96	0.94	0.92	0.93	0.96	0.97	0.98
b18	0.82	0.84	0.85	0.86	0.87	0.90	0.94	0.95	0.95	0.95	0.95	0.95
b19	0.89	0.94	0.95	0.95	0.96	0.98	0.99	0.99	0.99	1.00	1.00	0.99
b20	0.89	0.95	0.96	0.96	0.97	0.98	0.99	0.98	0.98	1.00	1.00	1.00
b21	0.89	0.95	0.96	0.96	0.97	0.98	0.98	0.97	0.97	0.99	1.00	1.00
b22	0.88	0.94	0.95	0.96	0.97	0.98	0.97	0.96	0.96	0.98	0.99	1.00
b23	0.88	0.94	0.95	0.96	0.97	0.97	0.96	0.94	0.95	0.98	0.99	1.00
b24	0.87	0.94	0.95	0.96	0.97	0.97	0.95	0.93	0.94	0.97	0.98	0.99
b25	0.86	0.94	0.95	0.96	0.96	0.96	0.94	0.91	0.92	0.95	0.97	0.98
b26	0.86	0.93	0.94	0.95	0.96	0.96	0.94	0.92	0.93	0.96	0.97	0.98
b27	0.82	0.84	0.85	0.86	0.87	0.90	0.94	0.95	0.95	0.95	0.95	0.95
b28	0.89	0.94	0.95	0.95	0.96	0.98	0.99	0.99	0.99	1.00	1.00	0.99
b29	0.89	0.95	0.96	0.96	0.97	0.98	0.99	0.98	0.98	1.00	1.00	1.00
b30	0.89	0.95	0.96	0.96	0.97	0.98	0.98	0.97	0.97	0.99	1.00	1.00
b31	0.88	0.94	0.95	0.96	0.97	0.98	0.97	0.96	0.96	0.98	0.99	1.00
b32	0.88	0.94	0.95	0.96	0.97	0.97	0.96	0.94	0.95	0.98	0.99	1.00
b33	0.87	0.94	0.95	0.96	0.97	0.97	0.95	0.93	0.94	0.97	0.98	0.99
b34	0.86	0.94	0.95	0.96	0.96	0.96	0.94	0.91	0.92	0.95	0.97	0.98
b35	0.86	0.93	0.94	0.95	0.96	0.96	0.94	0.92	0.93	0.96	0.97	0.98
b36	0.82	0.84	0.85	0.86	0.87	0.90	0.94	0.95	0.95	0.95	0.95	0.95
b37	0.21	0.10	0.09	0.09	0.09	0.15	0.28	0.36	0.35	0.27	0.22	0.20
b38	0.21	0.09	0.09	0.08	0.09	0.15	0.28	0.35	0.35	0.27	0.21	0.19
b39	0.20	0.09	0.08	0.07	0.08	0.14	0.27	0.34	0.34	0.26	0.21	0.19
b40	0.19	0.08	0.07	0.06	0.07	0.13	0.26	0.33	0.33	0.25	0.20	0.17
b41	0.18	0.07	0.06	0.06	0.06	0.12	0.25	0.33	0.32	0.24	0.19	0.17
b42	0.18	0.06	0.05	0.05	0.06	0.12	0.25	0.32	0.32	0.24	0.18	0.16
b43	0.18	0.06	0.05	0.05	0.05	0.11	0.25	0.32	0.32	0.23	0.18	0.16
b44	0.18	0.06	0.05	0.05	0.06	0.12	0.25	0.32	0.32	0.24	0.18	0.16
b45	0.19	0.07	0.06	0.06	0.07	0.13	0.26	0.33	0.33	0.25	0.19	0.17
b46	0.21	0.09	0.08	0.08	0.08	0.14	0.27	0.35	0.34	0.26	0.21	0.19
b47	0.23	0.12	0.11	0.11	0.12	0.18	0.31	0.38	0.38	0.30	0.25	0.23
b48	0.26	0.16	0.16	0.16	0.17	0.22	0.35	0.42	0.42	0.35	0.30	0.28
b49	0.29	0.19	0.18	0.18	0.19	0.25	0.38	0.44	0.44	0.37	0.33	0.31
b50	0.30	0.20	0.19	0.19	0.20	0.26	0.38	0.45	0.45	0.38	0.34	0.32
b51	0.30	0.21	0.20	0.20	0.21	0.27	0.39	0.46	0.46	0.39	0.35	0.33
b52	0.31	0.21	0.21	0.21	0.22	0.27	0.39	0.46	0.46	0.39	0.35	0.34

Table 5 (cont.).

	b1	b2	b3	b4	b5	b6	b7	b8	b9	b10	b11	b12
b53	0.30	0.20	0.20	0.20	0.21	0.26	0.39	0.46	0.45	0.39	0.34	0.33
b54	0.29	0.19	0.19	0.19	0.20	0.25	0.38	0.44	0.44	0.37	0.33	0.32
b55	0.28	0.18	0.18	0.18	0.19	0.25	0.37	0.44	0.44	0.37	0.32	0.31
b56	0.28	0.18	0.18	0.18	0.19	0.24	0.37	0.43	0.43	0.36	0.32	0.31
b57	0.28	0.18	0.18	0.18	0.19	0.25	0.37	0.44	0.44	0.37	0.32	0.31
b58	0.29	0.19	0.19	0.19	0.20	0.25	0.38	0.44	0.44	0.38	0.33	0.32
b59	0.31	0.21	0.21	0.21	0.22	0.27	0.39	0.46	0.46	0.39	0.35	0.34
b60	0.33	0.24	0.23	0.24	0.25	0.30	0.42	0.48	0.48	0.42	0.38	0.37
b61	0.36	0.27	0.27	0.27	0.28	0.33	0.44	0.51	0.51	0.45	0.41	0.40
b62	0.36	0.28	0.28	0.28	0.29	0.34	0.44	0.51	0.51	0.45	0.42	0.41
b63	0.19	0.14	0.14	0.14	0.14	0.14	0.14	0.13	0.14	0.14	0.14	0.14
b64	0.30	0.25	0.25	0.25	0.26	0.26	0.26	0.26	0.27	0.27	0.27	0.28
b65	0.55	0.52	0.53	0.53	0.54	0.55	0.55	0.55	0.56	0.57	0.58	0.59
b66	0.02	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.05	0.05	0.05
b67	0.03	0.05	0.05	0.05	0.06	0.05	0.04	0.04	0.05	0.06	0.06	0.06
b68	0.05	0.07	0.07	0.08	0.08	0.08	0.07	0.07	0.07	0.09	0.09	0.09
b69	0.69	0.70	0.72	0.73	0.74	0.76	0.78	0.79	0.80	0.81	0.81	0.83
b70	0.68	0.69	0.71	0.72	0.73	0.75	0.77	0.79	0.80	0.80	0.81	0.82
b71	0.67	0.67	0.69	0.70	0.71	0.73	0.77	0.78	0.79	0.79	0.80	0.81
b72	0.66	0.66	0.67	0.68	0.69	0.72	0.76	0.78	0.79	0.78	0.78	0.79
b73	0.65	0.64	0.65	0.66	0.67	0.70	0.75	0.77	0.78	0.77	0.77	0.78
b74	0.63	0.62	0.63	0.64	0.65	0.69	0.74	0.76	0.77	0.76	0.76	0.76
b75	0.62	0.61	0.62	0.63	0.64	0.67	0.73	0.76	0.76	0.75	0.75	0.75
b76	0.61	0.59	0.60	0.61	0.63	0.66	0.72	0.75	0.76	0.74	0.73	0.74
b77	0.61	0.58	0.59	0.60	0.61	0.65	0.71	0.74	0.75	0.73	0.72	0.73
b78	0.60	0.57	0.58	0.59	0.60	0.64	0.70	0.74	0.74	0.73	0.71	0.72
b79	0.59	0.56	0.57	0.58	0.59	0.63	0.70	0.73	0.74	0.72	0.71	0.71
b80	0.58	0.56	0.56	0.57	0.59	0.63	0.69	0.73	0.74	0.71	0.70	0.70
b81	0.58	0.55	0.56	0.57	0.58	0.62	0.69	0.73	0.73	0.71	0.70	0.70
b82	0.58	0.55	0.56	0.57	0.58	0.62	0.69	0.73	0.74	0.71	0.70	0.70
b83	0.59	0.56	0.56	0.57	0.59	0.63	0.70	0.73	0.74	0.72	0.70	0.71
b84	0.59	0.56	0.57	0.58	0.59	0.63	0.70	0.73	0.74	0.72	0.71	0.71
b85	0.59	0.57	0.58	0.59	0.60	0.64	0.71	0.74	0.75	0.73	0.72	0.72
b86	0.60	0.58	0.59	0.60	0.61	0.65	0.71	0.75	0.75	0.74	0.72	0.73
b87	0.61	0.59	0.60	0.61	0.62	0.66	0.72	0.75	0.76	0.74	0.73	0.74
b88	0.61	0.59	0.60	0.61	0.63	0.67	0.73	0.76	0.76	0.75	0.74	0.74
b89	0.62	0.60	0.61	0.62	0.63	0.67	0.73	0.76	0.77	0.75	0.74	0.75
b90	0.62	0.61	0.62	0.63	0.64	0.68	0.73	0.76	0.77	0.76	0.75	0.75
b91	0.63	0.62	0.63	0.64	0.65	0.68	0.74	0.77	0.77	0.76	0.76	0.76
b92	0.63	0.62	0.63	0.64	0.66	0.69	0.74	0.77	0.77	0.76	0.76	0.76
b93	0.15	0.15	0.16	0.16	0.16	0.17	0.18	0.19	0.19	0.19	0.19	0.19
b94	0.61	0.60	0.62	0.63	0.64	0.67	0.72	0.75	0.75	0.75	0.74	0.74
b95	0.57	0.61	0.62	0.63	0.63	0.63	0.60	0.58	0.59	0.62	0.64	0.66
b96	-0.01	0.01	0.02	0.02	0.02	0.02	0.00	-0.01	0.00	0.02	0.02	0.02
b97	0.15	0.17	0.18	0.18	0.18	0.18	0.17	0.16	0.17	0.18	0.19	0.19
b98	0.03	0.05	0.06	0.06	0.07	0.06	0.05	0.04	0.05	0.07	0.07	0.07
b99	0.26	0.28	0.28	0.29	0.29	0.29	0.28	0.28	0.28	0.30	0.30	0.31
b100	0.76	0.81	0.83	0.84	0.85	0.85	0.84	0.82	0.83	0.86	0.89	0.90
b101	0.77	0.82	0.83	0.85	0.86	0.86	0.85	0.83	0.84	0.87	0.89	0.91
b102	0.77	0.82	0.83	0.85	0.86	0.86	0.85	0.84	0.85	0.88	0.90	0.91
b103	0.77	0.82	0.83	0.84	0.86	0.86	0.86	0.85	0.86	0.88	0.90	0.91
b104	0.77	0.81	0.83	0.84	0.85	0.86	0.86	0.85	0.86	0.89	0.90	0.91
b105	0.77	0.81	0.82	0.83	0.85	0.86	0.86	0.86	0.87	0.89	0.90	0.91
b106	0.76	0.80	0.82	0.83	0.84	0.85	0.86	0.86	0.86	0.88	0.89	0.90

Table 5 (cont.).

	b1	b2	b3	b4	b5	b6	b7	b8	b9	b10	b11	b12
b107	0.75	0.79	0.81	0.82	0.83	0.84	0.85	0.85	0.86	0.88	0.89	0.90
b108	0.75	0.78	0.79	0.81	0.82	0.83	0.84	0.85	0.86	0.87	0.88	0.89
b109	0.74	0.77	0.78	0.79	0.81	0.82	0.84	0.84	0.85	0.86	0.87	0.88
b110	0.73	0.76	0.78	0.79	0.80	0.82	0.83	0.84	0.85	0.86	0.87	0.88
b111	0.74	0.76	0.78	0.79	0.80	0.82	0.83	0.84	0.85	0.86	0.87	0.88
b112	0.74	0.77	0.79	0.80	0.81	0.83	0.84	0.84	0.85	0.87	0.88	0.89
b113	0.75	0.79	0.80	0.81	0.83	0.84	0.85	0.85	0.86	0.88	0.89	0.90
b114	0.76	0.80	0.81	0.82	0.83	0.85	0.85	0.85	0.86	0.88	0.89	0.90
b115	0.76	0.80	0.81	0.82	0.84	0.85	0.85	0.85	0.86	0.88	0.89	0.90
b116	0.05	0.07	0.07	0.08	0.08	0.08	0.07	0.06	0.07	0.08	0.09	0.08
b117	0.06	0.07	0.08	0.08	0.08	0.08	0.07	0.07	0.07	0.09	0.09	0.09
b118	0.02	0.04	0.04	0.04	0.05	0.04	0.03	0.03	0.03	0.05	0.05	0.05
b119	-0.01	0.01	0.02	0.02	0.02	0.02	0.00	-0.01	0.01	0.03	0.03	0.03
b120	-0.01	0.02	0.02	0.02	0.03	0.02	0.01	0.00	0.01	0.03	0.03	0.03
b121	-0.03	-0.01	0.00	0.00	0.01	0.00	-0.02	-0.03	-0.02	0.01	0.01	0.00
b122	-0.02	0.00	0.01	0.01	0.01	0.01	-0.01	-0.02	-0.01	0.02	0.02	0.01
b123	-0.04	-0.01	-0.01	0.00	0.00	0.00	-0.02	-0.03	-0.02	0.00	0.01	0.00
b124	-0.07	-0.05	-0.04	-0.04	-0.04	-0.05	-0.07	-0.08	-0.08	-0.06	-0.05	-0.06
b125	-0.12	-0.11	-0.11	-0.11	-0.11	-0.12	-0.14	-0.15	-0.15	-0.14	-0.14	-0.14
b126	0.48	0.53	0.54	0.55	0.55	0.55	0.52	0.50	0.51	0.54	0.55	0.56

Table 5 (cont.).

	b13	b14	b15	b16	b17	b18	b19	b20	b21	b22	b23	b24
b13	1.00											
b14	1.00	1.00										
b15	1.00	1.00	1.00									
b16	0.99	0.99	1.00	1.00								
b17	0.99	0.99	1.00	1.00	1.00							
b18	0.95	0.94	0.93	0.92	0.93	1.00						
b19	0.98	0.98	0.97	0.95	0.96	0.95	1.00					
b20	0.99	0.99	0.98	0.97	0.97	0.95	1.00	1.00				
b21	1.00	1.00	0.99	0.98	0.98	0.95	0.99	1.00	1.00			
b22	1.00	1.00	1.00	0.99	0.99	0.95	0.98	0.99	1.00	1.00		
b23	1.00	1.00	1.00	0.99	0.99	0.94	0.98	0.99	1.00	1.00	1.00	
b24	1.00	1.00	1.00	1.00	1.00	0.93	0.97	0.98	0.99	1.00	1.00	1.00
b25	0.99	0.99	1.00	1.00	1.00	0.92	0.95	0.97	0.98	0.99	0.99	1.00
b26	0.99	0.99	1.00	1.00	1.00	0.93	0.96	0.97	0.98	0.99	0.99	1.00
b27	0.95	0.94	0.93	0.92	0.93	1.00	0.95	0.95	0.95	0.95	0.94	0.93
b28	0.98	0.98	0.97	0.95	0.96	0.95	1.00	1.00	0.99	0.98	0.98	0.97
b29	0.99	0.99	0.98	0.97	0.97	0.95	1.00	1.00	1.00	0.99	0.99	0.98
b30	1.00	1.00	0.99	0.98	0.98	0.95	0.99	1.00	1.00	1.00	1.00	0.99
b31	1.00	1.00	1.00	0.99	0.99	0.95	0.98	0.99	1.00	1.00	1.00	1.00
b32	1.00	1.00	1.00	0.99	0.99	0.94	0.98	0.99	1.00	1.00	1.00	1.00
b33	1.00	1.00	1.00	1.00	1.00	0.93	0.97	0.98	0.99	1.00	1.00	1.00
b34	0.99	0.99	1.00	1.00	1.00	0.92	0.95	0.97	0.98	0.99	0.99	1.00
b35	0.99	0.99	1.00	1.00	1.00	0.93	0.96	0.97	0.98	0.99	0.99	1.00
b36	0.95	0.94	0.93	0.92	0.93	1.00	0.95	0.95	0.95	0.95	0.94	0.93
b37	0.17	0.15	0.12	0.10	0.12	0.43	0.27	0.22	0.20	0.17	0.15	0.12
b38	0.17	0.14	0.11	0.09	0.12	0.43	0.27	0.21	0.19	0.17	0.14	0.11
b39	0.16	0.13	0.10	0.08	0.11	0.42	0.26	0.21	0.19	0.16	0.13	0.10
b40	0.15	0.12	0.09	0.07	0.10	0.41	0.25	0.20	0.17	0.15	0.12	0.09
b41	0.14	0.12	0.09	0.07	0.09	0.40	0.24	0.19	0.17	0.14	0.12	0.09
b42	0.14	0.11	0.08	0.06	0.09	0.40	0.24	0.18	0.16	0.14	0.11	0.08
b43	0.13	0.11	0.08	0.06	0.08	0.40	0.23	0.18	0.16	0.13	0.11	0.08
b44	0.14	0.11	0.08	0.06	0.09	0.40	0.24	0.18	0.16	0.14	0.11	0.08
b45	0.15	0.12	0.09	0.07	0.10	0.41	0.25	0.19	0.17	0.15	0.12	0.09
b46	0.17	0.14	0.11	0.09	0.12	0.43	0.26	0.21	0.19	0.17	0.14	0.11
b47	0.21	0.19	0.16	0.14	0.17	0.47	0.30	0.25	0.23	0.21	0.19	0.16
b48	0.26	0.24	0.21	0.20	0.22	0.52	0.35	0.30	0.28	0.26	0.24	0.21
b49	0.29	0.27	0.25	0.23	0.26	0.55	0.37	0.33	0.31	0.29	0.27	0.25
b50	0.30	0.28	0.26	0.24	0.27	0.56	0.38	0.34	0.32	0.30	0.28	0.26
b51	0.31	0.29	0.27	0.25	0.28	0.57	0.39	0.35	0.33	0.31	0.29	0.27
b52	0.32	0.30	0.27	0.26	0.28	0.57	0.39	0.35	0.34	0.32	0.30	0.27
b53	0.31	0.29	0.26	0.25	0.28	0.56	0.39	0.34	0.33	0.31	0.29	0.26
b54	0.30	0.28	0.25	0.24	0.26	0.55	0.37	0.33	0.32	0.30	0.28	0.25
b55	0.29	0.27	0.25	0.23	0.26	0.54	0.37	0.32	0.31	0.29	0.27	0.25
b56	0.29	0.27	0.24	0.23	0.25	0.54	0.36	0.32	0.31	0.29	0.27	0.24
b57	0.29	0.27	0.25	0.23	0.26	0.55	0.37	0.32	0.31	0.29	0.27	0.25
b58	0.30	0.28	0.26	0.24	0.27	0.55	0.38	0.33	0.32	0.30	0.28	0.26
b59	0.32	0.30	0.28	0.26	0.29	0.57	0.39	0.35	0.34	0.32	0.30	0.28
b60	0.35	0.33	0.31	0.30	0.33	0.60	0.42	0.38	0.37	0.35	0.33	0.31
b61	0.39	0.37	0.35	0.34	0.36	0.62	0.45	0.41	0.40	0.39	0.37	0.35
b62	0.39	0.38	0.36	0.34	0.37	0.61	0.45	0.42	0.41	0.39	0.38	0.36
b63	0.15	0.14	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.15	0.14	0.15
b64	0.28	0.28	0.28	0.29	0.29	0.29	0.27	0.27	0.28	0.28	0.28	0.28
b65	0.60	0.60	0.60	0.61	0.62	0.62	0.57	0.58	0.59	0.60	0.60	0.60
b66	0.05	0.05	0.05	0.04	0.04	0.00	0.05	0.05	0.05	0.05	0.05	0.05

Table 5 (cont.).

	b13	b14	b15	b16	b17	b18	b19	b20	b21	b22	b23	b24
b67	0.06	0.06	0.06	0.06	0.06	0.01	0.06	0.06	0.06	0.06	0.06	0.06
b68	0.09	0.09	0.08	0.08	0.08	0.04	0.09	0.09	0.09	0.09	0.09	0.08
b69	0.83	0.83	0.84	0.84	0.86	0.89	0.81	0.81	0.83	0.83	0.83	0.84
b70	0.82	0.83	0.83	0.83	0.85	0.89	0.80	0.81	0.82	0.82	0.83	0.83
b71	0.81	0.81	0.81	0.81	0.83	0.89	0.79	0.80	0.81	0.81	0.81	0.81
b72	0.79	0.79	0.79	0.79	0.81	0.89	0.78	0.78	0.79	0.79	0.79	0.79
b73	0.78	0.78	0.78	0.77	0.79	0.88	0.77	0.77	0.78	0.78	0.78	0.78
b74	0.76	0.76	0.76	0.76	0.77	0.88	0.76	0.76	0.76	0.76	0.76	0.76
b75	0.75	0.75	0.74	0.74	0.76	0.87	0.75	0.75	0.75	0.75	0.75	0.74
b76	0.74	0.74	0.73	0.72	0.75	0.86	0.74	0.73	0.74	0.74	0.74	0.73
b77	0.73	0.72	0.72	0.71	0.73	0.86	0.73	0.72	0.73	0.73	0.72	0.72
b78	0.72	0.71	0.71	0.70	0.72	0.85	0.73	0.71	0.72	0.72	0.71	0.71
b79	0.71	0.70	0.70	0.69	0.71	0.85	0.72	0.71	0.71	0.71	0.70	0.70
b80	0.70	0.70	0.69	0.68	0.71	0.84	0.71	0.70	0.70	0.70	0.70	0.69
b81	0.70	0.70	0.69	0.68	0.70	0.84	0.71	0.70	0.70	0.70	0.70	0.69
b82	0.70	0.70	0.69	0.68	0.70	0.84	0.71	0.70	0.70	0.70	0.70	0.69
b83	0.70	0.70	0.69	0.68	0.70	0.85	0.72	0.70	0.71	0.70	0.70	0.69
b84	0.71	0.70	0.69	0.69	0.71	0.85	0.72	0.71	0.71	0.71	0.70	0.69
b85	0.71	0.71	0.70	0.69	0.72	0.85	0.73	0.72	0.72	0.71	0.71	0.70
b86	0.72	0.72	0.71	0.71	0.73	0.86	0.74	0.72	0.73	0.72	0.72	0.71
b87	0.73	0.73	0.72	0.71	0.74	0.86	0.74	0.73	0.74	0.73	0.73	0.72
b88	0.74	0.74	0.73	0.72	0.74	0.87	0.75	0.74	0.74	0.74	0.74	0.73
b89	0.75	0.74	0.74	0.73	0.75	0.87	0.75	0.74	0.75	0.75	0.74	0.74
b90	0.75	0.75	0.74	0.74	0.76	0.87	0.76	0.75	0.75	0.75	0.75	0.74
b91	0.76	0.76	0.75	0.75	0.77	0.88	0.76	0.76	0.76	0.76	0.76	0.75
b92	0.76	0.76	0.76	0.75	0.77	0.88	0.76	0.76	0.76	0.76	0.76	0.76
b93	0.19	0.19	0.19	0.19	0.19	0.20	0.19	0.19	0.19	0.19	0.19	0.19
b94	0.74	0.75	0.74	0.74	0.76	0.86	0.75	0.74	0.74	0.74	0.75	0.74
b95	0.67	0.67	0.69	0.69	0.70	0.62	0.62	0.64	0.66	0.67	0.67	0.69
b96	0.02	0.02	0.02	0.02	0.01	-0.06	0.02	0.02	0.02	0.02	0.02	0.02
b97	0.19	0.19	0.20	0.20	0.20	0.16	0.18	0.19	0.19	0.19	0.19	0.20
b98	0.07	0.07	0.07	0.06	0.06	0.00	0.07	0.07	0.07	0.07	0.07	0.07
b99	0.31	0.32	0.32	0.32	0.32	0.29	0.30	0.30	0.31	0.31	0.32	0.32
b100	0.91	0.92	0.93	0.94	0.94	0.89	0.86	0.89	0.90	0.91	0.92	0.93
b101	0.92	0.93	0.93	0.94	0.94	0.90	0.87	0.89	0.91	0.92	0.93	0.93
b102	0.92	0.93	0.93	0.94	0.94	0.91	0.88	0.90	0.91	0.92	0.93	0.93
b103	0.92	0.93	0.93	0.94	0.94	0.91	0.88	0.90	0.91	0.92	0.93	0.93
b104	0.92	0.92	0.93	0.93	0.94	0.92	0.89	0.90	0.91	0.92	0.92	0.93
b105	0.92	0.92	0.92	0.93	0.93	0.92	0.89	0.90	0.91	0.92	0.92	0.92
b106	0.91	0.92	0.92	0.92	0.93	0.92	0.88	0.89	0.90	0.91	0.92	0.92
b107	0.90	0.91	0.91	0.91	0.92	0.92	0.88	0.89	0.90	0.90	0.91	0.91
b108	0.90	0.90	0.90	0.91	0.92	0.92	0.87	0.88	0.89	0.90	0.90	0.90
b109	0.89	0.89	0.89	0.90	0.91	0.92	0.86	0.87	0.88	0.89	0.89	0.89
b110	0.88	0.89	0.89	0.89	0.90	0.92	0.86	0.87	0.88	0.88	0.89	0.89
b111	0.89	0.89	0.89	0.89	0.90	0.92	0.86	0.87	0.88	0.89	0.89	0.89
b112	0.89	0.90	0.90	0.90	0.91	0.92	0.87	0.88	0.89	0.89	0.90	0.90
b113	0.90	0.91	0.91	0.91	0.92	0.92	0.88	0.89	0.90	0.90	0.91	0.91
b114	0.91	0.91	0.92	0.92	0.93	0.92	0.88	0.89	0.90	0.91	0.91	0.92
b115	0.91	0.91	0.92	0.92	0.93	0.92	0.88	0.89	0.90	0.91	0.91	0.92
b116	0.09	0.09	0.08	0.08	0.08	0.04	0.08	0.09	0.08	0.09	0.09	0.08
b117	0.09	0.09	0.09	0.09	0.08	0.04	0.09	0.09	0.09	0.09	0.09	0.09
b118	0.05	0.05	0.05	0.04	0.04	-0.02	0.05	0.05	0.05	0.05	0.05	0.05
b119	0.03	0.02	0.02	0.02	0.01	-0.07	0.03	0.03	0.03	0.03	0.02	0.02
b120	0.03	0.03	0.02	0.02	0.02	-0.05	0.03	0.03	0.03	0.03	0.03	0.02

Table 5 (cont.).

	b13	b14	b15	b16	b17	b18	b19	b20	b21	b22	b23	b24
b121	0.01	0.01	0.00	0.00	-0.01	-0.10	0.01	0.01	0.00	0.01	0.01	0.00
b122	0.01	0.01	0.01	0.01	0.00	-0.07	0.02	0.02	0.01	0.01	0.01	0.01
b123	0.00	0.00	0.00	-0.01	-0.01	-0.10	0.00	0.01	0.00	0.00	0.00	0.00
b124	-0.05	-0.05	-0.05	-0.05	-0.06	-0.13	-0.06	-0.05	-0.06	-0.05	-0.05	-0.05
b125	-0.14	-0.13	-0.13	-0.13	-0.14	-0.18	-0.14	-0.14	-0.14	-0.14	-0.13	-0.13
b126	0.58	0.57	0.59	0.59	0.60	0.52	0.54	0.55	0.56	0.58	0.57	0.59

Table 5 (cont.).

	b25	b26	b27	b28	b29	b30	b31	b32	b33	b34	b35	b36
b25	1.00											
b26	1.00	1.00										
b27	0.92	0.93	1.00									
b28	0.95	0.96	0.95	1.00								
b29	0.97	0.97	0.95	1.00	1.00							
b30	0.98	0.98	0.95	0.99	1.00	1.00						
b31	0.99	0.99	0.95	0.98	0.99	1.00	1.00					
b32	0.99	0.99	0.94	0.98	0.99	1.00	1.00	1.00				
b33	1.00	1.00	0.93	0.97	0.98	0.99	1.00	1.00	1.00			
b34	1.00	1.00	0.92	0.95	0.97	0.98	0.99	0.99	1.00	1.00		
b35	1.00	1.00	0.93	0.96	0.97	0.98	0.99	0.99	1.00	1.00	1.00	
b36	0.92	0.93	1.00	0.95	0.95	0.95	0.95	0.94	0.93	0.92	0.93	1.00
b37	0.10	0.12	0.43	0.27	0.22	0.20	0.17	0.15	0.12	0.10	0.12	0.43
b38	0.09	0.12	0.43	0.27	0.21	0.19	0.17	0.14	0.11	0.09	0.12	0.43
b39	0.08	0.11	0.42	0.26	0.21	0.19	0.16	0.13	0.10	0.08	0.11	0.42
b40	0.07	0.10	0.41	0.25	0.20	0.17	0.15	0.12	0.09	0.07	0.10	0.41
b41	0.07	0.09	0.40	0.24	0.19	0.17	0.14	0.12	0.09	0.07	0.09	0.40
b42	0.06	0.09	0.40	0.24	0.18	0.16	0.14	0.11	0.08	0.06	0.09	0.40
b43	0.06	0.08	0.40	0.23	0.18	0.16	0.13	0.11	0.08	0.06	0.08	0.40
b44	0.06	0.09	0.40	0.24	0.18	0.16	0.14	0.11	0.08	0.06	0.09	0.40
b45	0.07	0.10	0.41	0.25	0.19	0.17	0.15	0.12	0.09	0.07	0.10	0.41
b46	0.09	0.12	0.43	0.26	0.21	0.19	0.17	0.14	0.11	0.09	0.12	0.43
b47	0.14	0.17	0.47	0.30	0.25	0.23	0.21	0.19	0.16	0.14	0.17	0.47
b48	0.20	0.22	0.52	0.35	0.30	0.28	0.26	0.24	0.21	0.20	0.22	0.52
b49	0.23	0.26	0.55	0.37	0.33	0.31	0.29	0.27	0.25	0.23	0.26	0.55
b50	0.24	0.27	0.56	0.38	0.34	0.32	0.30	0.28	0.26	0.24	0.27	0.56
b51	0.25	0.28	0.57	0.39	0.35	0.33	0.31	0.29	0.27	0.25	0.28	0.57
b52	0.26	0.28	0.57	0.39	0.35	0.34	0.32	0.30	0.27	0.26	0.28	0.57
b53	0.25	0.28	0.56	0.39	0.34	0.33	0.31	0.29	0.26	0.25	0.28	0.56
b54	0.24	0.26	0.55	0.37	0.33	0.32	0.30	0.28	0.25	0.24	0.26	0.55
b55	0.23	0.26	0.54	0.37	0.32	0.31	0.29	0.27	0.25	0.23	0.26	0.54
b56	0.23	0.25	0.54	0.36	0.32	0.31	0.29	0.27	0.24	0.23	0.25	0.54
b57	0.23	0.26	0.55	0.37	0.32	0.31	0.29	0.27	0.25	0.23	0.26	0.55
b58	0.24	0.27	0.55	0.38	0.33	0.32	0.30	0.28	0.26	0.24	0.27	0.55
b59	0.26	0.29	0.57	0.39	0.35	0.34	0.32	0.30	0.28	0.26	0.29	0.57
b60	0.30	0.33	0.60	0.42	0.38	0.37	0.35	0.33	0.31	0.30	0.33	0.60
b61	0.34	0.36	0.62	0.45	0.41	0.40	0.39	0.37	0.35	0.34	0.36	0.62
b62	0.34	0.37	0.61	0.45	0.42	0.41	0.39	0.38	0.36	0.34	0.37	0.61
b63	0.15	0.15	0.15	0.14	0.14	0.14	0.15	0.14	0.15	0.15	0.15	0.15
b64	0.29	0.29	0.29	0.27	0.27	0.28	0.28	0.28	0.28	0.29	0.29	0.29
b65	0.61	0.62	0.62	0.57	0.58	0.59	0.60	0.60	0.60	0.61	0.62	0.62
b66	0.04	0.04	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.04	0.00
b67	0.06	0.06	0.01	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.01
b68	0.08	0.08	0.04	0.09	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.04
b69	0.84	0.86	0.89	0.81	0.81	0.83	0.83	0.83	0.84	0.84	0.86	0.89
b70	0.83	0.85	0.89	0.80	0.81	0.82	0.82	0.83	0.83	0.83	0.85	0.89
b71	0.81	0.83	0.89	0.79	0.80	0.81	0.81	0.81	0.81	0.81	0.83	0.89
b72	0.79	0.81	0.89	0.78	0.78	0.79	0.79	0.79	0.79	0.79	0.81	0.89
b73	0.77	0.79	0.88	0.77	0.77	0.78	0.78	0.78	0.78	0.77	0.79	0.88
b74	0.76	0.77	0.88	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.77	0.88
b75	0.74	0.76	0.87	0.75	0.75	0.75	0.75	0.75	0.74	0.74	0.76	0.87
b76	0.72	0.75	0.86	0.74	0.73	0.74	0.74	0.74	0.73	0.72	0.75	0.86
b77	0.71	0.73	0.86	0.73	0.72	0.73	0.73	0.72	0.72	0.71	0.73	0.86
b78	0.70	0.72	0.85	0.73	0.71	0.72	0.72	0.71	0.71	0.70	0.72	0.85

Table 5 (cont.).

	b25	b26	b27	b28	b29	b30	b31	b32	b33	b34	b35	b36
b79	0.69	0.71	0.85	0.72	0.71	0.71	0.71	0.70	0.70	0.69	0.71	0.85
b80	0.68	0.71	0.84	0.71	0.70	0.70	0.70	0.70	0.69	0.68	0.71	0.84
b81	0.68	0.70	0.84	0.71	0.70	0.70	0.70	0.70	0.69	0.68	0.70	0.84
b82	0.68	0.70	0.84	0.71	0.70	0.70	0.70	0.70	0.69	0.68	0.70	0.84
b83	0.68	0.70	0.85	0.72	0.70	0.71	0.70	0.70	0.69	0.68	0.70	0.85
b84	0.69	0.71	0.85	0.72	0.71	0.71	0.71	0.70	0.69	0.69	0.71	0.85
b85	0.69	0.72	0.85	0.73	0.72	0.72	0.71	0.71	0.70	0.69	0.72	0.85
b86	0.71	0.73	0.86	0.74	0.72	0.73	0.72	0.72	0.71	0.71	0.73	0.86
b87	0.71	0.74	0.86	0.74	0.73	0.74	0.73	0.73	0.72	0.71	0.74	0.86
b88	0.72	0.74	0.87	0.75	0.74	0.74	0.74	0.74	0.73	0.72	0.74	0.87
b89	0.73	0.75	0.87	0.75	0.74	0.75	0.75	0.74	0.74	0.73	0.75	0.87
b90	0.74	0.76	0.87	0.76	0.75	0.75	0.75	0.75	0.74	0.74	0.76	0.87
b91	0.75	0.77	0.88	0.76	0.76	0.76	0.76	0.76	0.75	0.75	0.77	0.88
b92	0.75	0.77	0.88	0.76	0.76	0.76	0.76	0.76	0.76	0.75	0.77	0.88
b93	0.19	0.19	0.20	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.20
b94	0.74	0.76	0.86	0.75	0.74	0.74	0.74	0.75	0.74	0.74	0.76	0.86
b95	0.69	0.70	0.62	0.62	0.64	0.66	0.67	0.67	0.69	0.69	0.70	0.62
b96	0.02	0.01	-0.06	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	-0.06
b97	0.20	0.20	0.16	0.18	0.19	0.19	0.19	0.19	0.20	0.20	0.20	0.16
b98	0.06	0.06	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.06	0.00
b99	0.32	0.32	0.29	0.30	0.30	0.31	0.31	0.32	0.32	0.32	0.32	0.29
b100	0.94	0.94	0.89	0.86	0.89	0.90	0.91	0.92	0.93	0.94	0.94	0.89
b101	0.94	0.94	0.90	0.87	0.89	0.91	0.92	0.93	0.93	0.94	0.94	0.90
b102	0.94	0.94	0.91	0.88	0.90	0.91	0.92	0.93	0.93	0.94	0.94	0.91
b103	0.94	0.94	0.91	0.88	0.90	0.91	0.92	0.93	0.93	0.94	0.94	0.91
b104	0.93	0.94	0.92	0.89	0.90	0.91	0.92	0.92	0.93	0.93	0.94	0.92
b105	0.93	0.93	0.92	0.89	0.90	0.91	0.92	0.92	0.92	0.93	0.93	0.92
b106	0.92	0.93	0.92	0.88	0.89	0.90	0.91	0.92	0.92	0.92	0.93	0.92
b107	0.91	0.92	0.92	0.88	0.89	0.90	0.90	0.91	0.91	0.91	0.92	0.92
b108	0.91	0.92	0.92	0.87	0.88	0.89	0.90	0.90	0.90	0.91	0.92	0.92
b109	0.90	0.91	0.92	0.86	0.87	0.88	0.89	0.89	0.89	0.90	0.91	0.92
b110	0.89	0.90	0.92	0.86	0.87	0.88	0.88	0.89	0.89	0.89	0.90	0.92
b111	0.89	0.90	0.92	0.86	0.87	0.88	0.89	0.89	0.89	0.89	0.90	0.92
b112	0.90	0.91	0.92	0.87	0.88	0.89	0.89	0.90	0.90	0.90	0.91	0.92
b113	0.91	0.92	0.92	0.88	0.89	0.90	0.90	0.91	0.91	0.91	0.92	0.92
b114	0.92	0.93	0.92	0.88	0.89	0.90	0.91	0.91	0.92	0.92	0.93	0.92
b115	0.92	0.93	0.92	0.88	0.89	0.90	0.91	0.91	0.92	0.92	0.93	0.92
b116	0.08	0.08	0.04	0.08	0.09	0.08	0.09	0.09	0.08	0.08	0.08	0.04
b117	0.09	0.08	0.04	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.08	0.04
b118	0.04	0.04	-0.02	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.04	-0.02
b119	0.02	0.01	-0.07	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.01	-0.07
b120	0.02	0.02	-0.05	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	-0.05
b121	0.00	-0.01	-0.10	0.01	0.01	0.00	0.01	0.01	0.00	0.00	-0.01	-0.10
b122	0.01	0.00	-0.07	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.00	-0.07
b123	-0.01	-0.01	-0.10	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.10
b124	-0.05	-0.06	-0.13	-0.06	-0.05	-0.06	-0.05	-0.05	-0.05	-0.05	-0.06	-0.13
b125	-0.13	-0.14	-0.18	-0.14	-0.14	-0.14	-0.14	-0.13	-0.13	-0.13	-0.14	-0.18
b126	0.59	0.60	0.52	0.54	0.55	0.56	0.58	0.57	0.59	0.59	0.60	0.52

Table 5 (cont.).

	b37	b38	b39	b40	b41	b42	b43	b44	b45	b46	b47	b48
b37	1.00											
b38	1.00	1.00										
b39	1.00	1.00	1.00									
b40	1.00	1.00	1.00	1.00								
b41	1.00	1.00	1.00	1.00	1.00							
b42	1.00	1.00	1.00	1.00	1.00	1.00						
b43	1.00	1.00	1.00	1.00	1.00	1.00	1.00					
b44	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
b45	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
b46	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
b47	1.00	1.00	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	1.00	
b48	0.99	0.99	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	1.00	1.00
b49	0.98	0.98	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.99	1.00
b50	0.98	0.98	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.99	1.00
b51	0.97	0.97	0.97	0.97	0.96	0.96	0.96	0.97	0.97	0.97	0.99	0.99
b52	0.97	0.97	0.97	0.96	0.96	0.96	0.96	0.96	0.97	0.97	0.99	1.00
b53	0.97	0.97	0.97	0.97	0.97	0.96	0.96	0.97	0.97	0.97	0.99	1.00
b54	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.98	0.99	1.00
b55	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.98	0.99	0.99
b56	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.98	0.99	1.00
b57	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.98	0.99	1.00
b58	0.97	0.97	0.97	0.96	0.96	0.96	0.96	0.96	0.97	0.97	0.98	0.99
b59	0.96	0.96	0.96	0.95	0.95	0.95	0.95	0.95	0.96	0.97	0.98	0.99
b60	0.94	0.95	0.94	0.94	0.94	0.94	0.94	0.94	0.95	0.95	0.97	0.98
b61	0.92	0.93	0.93	0.92	0.92	0.91	0.91	0.92	0.93	0.94	0.95	0.97
b62	0.90	0.91	0.91	0.90	0.89	0.89	0.89	0.90	0.91	0.92	0.93	0.94
b63	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.06	0.06	0.07	0.07	0.07
b64	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.11	0.12	0.13	0.15
b65	0.23	0.24	0.23	0.22	0.22	0.21	0.21	0.22	0.23	0.25	0.28	0.32
b66	-0.12	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12
b67	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.13	-0.13	-0.13	-0.12	-0.12	-0.11
b68	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.11	-0.11	-0.10	-0.10	-0.09	-0.08
b69	0.41	0.41	0.41	0.39	0.38	0.38	0.38	0.39	0.40	0.43	0.47	0.53
b70	0.44	0.44	0.44	0.42	0.42	0.41	0.41	0.42	0.43	0.46	0.50	0.56
b71	0.48	0.48	0.47	0.46	0.45	0.45	0.45	0.46	0.47	0.49	0.54	0.60
b72	0.51	0.51	0.51	0.50	0.49	0.48	0.48	0.49	0.51	0.53	0.57	0.63
b73	0.54	0.54	0.54	0.53	0.52	0.52	0.51	0.52	0.54	0.56	0.60	0.66
b74	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.55	0.56	0.59	0.63	0.68
b75	0.59	0.59	0.59	0.58	0.57	0.57	0.57	0.57	0.59	0.61	0.65	0.70
b76	0.61	0.61	0.61	0.59	0.59	0.59	0.58	0.59	0.60	0.63	0.67	0.72
b77	0.63	0.63	0.62	0.61	0.60	0.60	0.60	0.61	0.62	0.64	0.68	0.73
b78	0.64	0.64	0.63	0.62	0.62	0.61	0.61	0.62	0.63	0.65	0.69	0.74
b79	0.65	0.65	0.64	0.63	0.63	0.62	0.62	0.63	0.64	0.66	0.70	0.75
b80	0.66	0.66	0.65	0.64	0.63	0.63	0.63	0.64	0.65	0.67	0.71	0.76
b81	0.66	0.66	0.65	0.64	0.64	0.63	0.63	0.64	0.65	0.67	0.71	0.76
b82	0.66	0.66	0.65	0.64	0.64	0.63	0.63	0.64	0.65	0.67	0.71	0.76
b83	0.66	0.66	0.65	0.64	0.64	0.63	0.63	0.64	0.65	0.67	0.71	0.76
b84	0.66	0.66	0.65	0.64	0.63	0.63	0.63	0.64	0.65	0.67	0.71	0.76
b85	0.65	0.65	0.64	0.63	0.63	0.62	0.62	0.63	0.64	0.66	0.70	0.75
b86	0.64	0.63	0.63	0.62	0.61	0.61	0.61	0.61	0.63	0.65	0.69	0.74
b87	0.63	0.62	0.62	0.61	0.60	0.60	0.60	0.60	0.62	0.64	0.68	0.73
b88	0.62	0.62	0.61	0.60	0.59	0.59	0.59	0.60	0.61	0.63	0.67	0.72
b89	0.61	0.61	0.60	0.59	0.58	0.58	0.58	0.59	0.60	0.62	0.66	0.71
b90	0.60	0.59	0.59	0.58	0.57	0.57	0.57	0.57	0.59	0.61	0.65	0.70

Table 5 (cont.).

	b37	b38	b39	b40	b41	b42	b43	b44	b45	b46	b47	b48
b91	0.59	0.58	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.59	0.64	0.69
b92	0.58	0.57	0.57	0.55	0.55	0.54	0.54	0.55	0.56	0.58	0.63	0.69
b93	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.09	0.11
b94	0.55	0.55	0.54	0.53	0.53	0.52	0.52	0.53	0.54	0.56	0.61	0.66
b95	0.03	0.03	0.03	0.02	0.01	0.01	0.00	0.01	0.02	0.04	0.07	0.12
b96	-0.21	-0.22	-0.22	-0.22	-0.22	-0.22	-0.22	-0.23	-0.23	-0.22	-0.22	-0.21
b97	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.04	-0.02
b98	-0.18	-0.18	-0.18	-0.19	-0.19	-0.19	-0.19	-0.19	-0.19	-0.19	-0.18	-0.17
b99	0.01	0.01	0.00	0.00	-0.01	-0.01	-0.01	-0.01	0.00	0.01	0.03	0.05
b100	0.18	0.17	0.16	0.15	0.15	0.14	0.14	0.15	0.16	0.18	0.24	0.30
b101	0.20	0.20	0.19	0.18	0.17	0.17	0.17	0.17	0.19	0.21	0.26	0.33
b102	0.23	0.23	0.22	0.21	0.20	0.20	0.20	0.20	0.22	0.24	0.29	0.35
b103	0.26	0.25	0.24	0.23	0.22	0.22	0.22	0.22	0.24	0.26	0.31	0.37
b104	0.27	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.26	0.28	0.33	0.39
b105	0.29	0.28	0.28	0.26	0.26	0.25	0.25	0.26	0.27	0.29	0.35	0.41
b106	0.30	0.30	0.29	0.28	0.27	0.26	0.26	0.27	0.28	0.31	0.36	0.42
b107	0.31	0.31	0.30	0.29	0.28	0.28	0.28	0.28	0.30	0.32	0.37	0.43
b108	0.33	0.32	0.32	0.30	0.30	0.29	0.29	0.30	0.31	0.34	0.39	0.45
b109	0.34	0.34	0.33	0.32	0.31	0.31	0.31	0.31	0.33	0.35	0.40	0.46
b110	0.35	0.35	0.34	0.33	0.32	0.32	0.31	0.32	0.34	0.36	0.41	0.47
b111	0.35	0.35	0.34	0.33	0.32	0.32	0.31	0.32	0.34	0.36	0.41	0.47
b112	0.34	0.34	0.33	0.32	0.31	0.31	0.31	0.31	0.33	0.35	0.40	0.46
b113	0.32	0.32	0.31	0.30	0.29	0.29	0.29	0.29	0.31	0.33	0.38	0.44
b114	0.31	0.30	0.29	0.28	0.27	0.27	0.27	0.27	0.29	0.31	0.36	0.42
b115	0.29	0.28	0.27	0.26	0.26	0.25	0.25	0.26	0.27	0.29	0.35	0.41
b116	-0.11	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.11	-0.10
b117	-0.10	-0.10	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.10	-0.09
b118	-0.17	-0.18	-0.18	-0.18	-0.18	-0.18	-0.19	-0.19	-0.19	-0.18	-0.18	-0.17
b119	-0.25	-0.25	-0.25	-0.26	-0.26	-0.26	-0.26	-0.26	-0.26	-0.26	-0.25	-0.25
b120	-0.21	-0.22	-0.22	-0.22	-0.22	-0.22	-0.23	-0.23	-0.23	-0.22	-0.22	-0.21
b121	-0.28	-0.29	-0.29	-0.29	-0.29	-0.30	-0.30	-0.30	-0.30	-0.30	-0.29	-0.28
b122	-0.23	-0.24	-0.24	-0.24	-0.24	-0.24	-0.25	-0.25	-0.25	-0.25	-0.24	-0.23
b123	-0.27	-0.27	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.29	-0.28	-0.28	-0.27
b124	-0.24	-0.24	-0.24	-0.25	-0.24	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
b125	-0.17	-0.18	-0.18	-0.17	-0.17	-0.17	-0.17	-0.18	-0.18	-0.18	-0.19	-0.20
b126	0.03	0.03	0.03	0.02	0.01	0.01	0.01	0.01	0.03	0.04	0.06	0.10

Table 5 (cont.).

	b49	b50	b51	b52	b53	b54	b55	b56	b57	b58	b59	b60
b49	1.00											
b50	1.00	1.00										
b51	1.00	1.00	1.00									
b52	1.00	1.00	1.00	1.00								
b53	1.00	1.00	1.00	1.00	1.00							
b54	1.00	1.00	1.00	1.00	1.00	1.00						
b55	1.00	1.00	1.00	1.00	1.00	1.00	1.00					
b56	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
b57	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
b58	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
b59	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
b60	0.99	0.99	1.00	1.00	1.00	0.99	0.99	0.99	0.99	1.00	1.00	1.00
b61	0.97	0.98	0.99	0.99	0.99	0.99	0.99	0.99	0.98	0.99	0.99	1.00
b62	0.95	0.96	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.98	0.98
b63	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.10
b64	0.16	0.17	0.18	0.18	0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.19
b65	0.34	0.36	0.37	0.37	0.36	0.36	0.36	0.36	0.36	0.37	0.38	0.41
b66	-0.11	-0.11	-0.11	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.11
b67	-0.10	-0.10	-0.10	-0.10	-0.10	-0.11	-0.11	-0.11	-0.11	-0.11	-0.10	-0.10
b68	-0.08	-0.08	-0.07	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.07
b69	0.56	0.58	0.60	0.60	0.59	0.58	0.58	0.58	0.58	0.60	0.62	0.65
b70	0.59	0.61	0.63	0.63	0.62	0.61	0.61	0.61	0.61	0.63	0.65	0.68
b71	0.63	0.64	0.66	0.66	0.66	0.65	0.64	0.64	0.65	0.66	0.68	0.71
b72	0.66	0.68	0.69	0.69	0.69	0.68	0.67	0.67	0.68	0.69	0.71	0.74
b73	0.69	0.70	0.72	0.72	0.71	0.70	0.70	0.70	0.70	0.72	0.74	0.77
b74	0.71	0.73	0.74	0.74	0.74	0.73	0.72	0.72	0.73	0.74	0.76	0.79
b75	0.73	0.75	0.76	0.76	0.76	0.75	0.74	0.74	0.75	0.76	0.78	0.80
b76	0.75	0.76	0.77	0.78	0.77	0.76	0.76	0.76	0.76	0.77	0.79	0.82
b77	0.76	0.77	0.79	0.79	0.78	0.78	0.77	0.77	0.77	0.79	0.80	0.83
b78	0.77	0.78	0.80	0.80	0.79	0.78	0.78	0.78	0.78	0.79	0.81	0.84
b79	0.78	0.79	0.80	0.81	0.80	0.79	0.79	0.79	0.79	0.80	0.82	0.84
b80	0.78	0.80	0.81	0.81	0.81	0.80	0.80	0.79	0.80	0.81	0.83	0.85
b81	0.79	0.80	0.81	0.81	0.81	0.80	0.80	0.80	0.80	0.81	0.83	0.85
b82	0.79	0.80	0.81	0.81	0.81	0.80	0.80	0.80	0.80	0.81	0.83	0.85
b83	0.79	0.80	0.81	0.81	0.81	0.80	0.80	0.80	0.80	0.81	0.83	0.85
b84	0.78	0.80	0.81	0.81	0.81	0.80	0.79	0.79	0.80	0.81	0.82	0.85
b85	0.78	0.79	0.80	0.81	0.80	0.79	0.79	0.79	0.79	0.80	0.82	0.84
b86	0.77	0.78	0.79	0.79	0.79	0.78	0.78	0.78	0.78	0.79	0.81	0.83
b87	0.76	0.77	0.78	0.79	0.78	0.77	0.77	0.77	0.77	0.78	0.80	0.82
b88	0.75	0.76	0.78	0.78	0.77	0.76	0.76	0.76	0.76	0.77	0.79	0.82
b89	0.74	0.76	0.77	0.77	0.77	0.76	0.75	0.75	0.76	0.77	0.78	0.81
b90	0.73	0.75	0.76	0.76	0.76	0.75	0.74	0.74	0.75	0.76	0.78	0.80
b91	0.72	0.74	0.75	0.75	0.75	0.74	0.73	0.73	0.74	0.75	0.77	0.79
b92	0.72	0.73	0.74	0.74	0.74	0.73	0.72	0.72	0.73	0.74	0.76	0.79
b93	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.11	0.12	0.12	0.12	0.13
b94	0.69	0.70	0.71	0.72	0.71	0.70	0.70	0.70	0.70	0.71	0.73	0.76
b95	0.14	0.16	0.17	0.17	0.17	0.16	0.16	0.16	0.16	0.17	0.19	0.22
b96	-0.21	-0.21	-0.21	-0.21	-0.21	-0.21	-0.21	-0.22	-0.22	-0.22	-0.21	-0.21
b97	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.01	-0.01	0.01
b98	-0.17	-0.16	-0.16	-0.16	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.16
b99	0.06	0.07	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.10
b100	0.34	0.35	0.37	0.37	0.36	0.35	0.35	0.35	0.35	0.37	0.39	0.43
b101	0.36	0.38	0.39	0.40	0.39	0.38	0.37	0.37	0.38	0.39	0.42	0.45
b102	0.39	0.40	0.42	0.42	0.42	0.40	0.40	0.40	0.40	0.42	0.44	0.48

Table 5 (cont.).

	b49	b50	b51	b52	b53	b54	b55	b56	b57	b58	b59	b60
b103	0.41	0.43	0.44	0.44	0.44	0.42	0.42	0.42	0.42	0.44	0.46	0.50
b104	0.43	0.44	0.46	0.46	0.45	0.44	0.44	0.43	0.44	0.45	0.48	0.51
b105	0.44	0.46	0.47	0.47	0.47	0.46	0.45	0.45	0.45	0.47	0.49	0.53
b106	0.45	0.47	0.48	0.49	0.48	0.47	0.46	0.46	0.47	0.48	0.50	0.54
b107	0.47	0.48	0.50	0.50	0.49	0.48	0.48	0.47	0.48	0.49	0.52	0.55
b108	0.48	0.50	0.51	0.52	0.51	0.50	0.49	0.49	0.50	0.51	0.53	0.57
b109	0.50	0.51	0.53	0.53	0.52	0.51	0.51	0.51	0.51	0.53	0.55	0.58
b110	0.51	0.52	0.54	0.54	0.53	0.52	0.51	0.51	0.52	0.53	0.56	0.59
b111	0.51	0.52	0.53	0.54	0.53	0.52	0.51	0.51	0.52	0.53	0.55	0.59
b112	0.50	0.51	0.53	0.53	0.52	0.51	0.50	0.50	0.51	0.52	0.55	0.58
b113	0.48	0.49	0.51	0.51	0.50	0.49	0.48	0.48	0.49	0.50	0.53	0.56
b114	0.46	0.47	0.49	0.49	0.48	0.47	0.47	0.47	0.47	0.48	0.51	0.54
b115	0.44	0.46	0.47	0.47	0.47	0.46	0.45	0.45	0.45	0.47	0.49	0.53
b116	-0.09	-0.09	-0.09	-0.09	-0.09	-0.10	-0.10	-0.10	-0.10	-0.10	-0.09	-0.09
b117	-0.09	-0.08	-0.08	-0.08	-0.08	-0.09	-0.09	-0.09	-0.09	-0.09	-0.08	-0.08
b118	-0.16	-0.16	-0.16	-0.16	-0.16	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.16
b119	-0.24	-0.24	-0.24	-0.24	-0.24	-0.24	-0.25	-0.25	-0.25	-0.25	-0.25	-0.24
b120	-0.21	-0.21	-0.21	-0.21	-0.21	-0.21	-0.21	-0.22	-0.22	-0.22	-0.21	-0.21
b121	-0.28	-0.28	-0.28	-0.28	-0.28	-0.29	-0.29	-0.29	-0.29	-0.29	-0.29	-0.28
b122	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23	-0.24	-0.24	-0.24	-0.24	-0.24	-0.23
b123	-0.27	-0.27	-0.27	-0.27	-0.27	-0.27	-0.28	-0.28	-0.28	-0.28	-0.28	-0.27
b124	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.26	-0.26	-0.26	-0.26	-0.26	-0.26
b125	-0.20	-0.21	-0.21	-0.21	-0.21	-0.21	-0.21	-0.21	-0.21	-0.22	-0.22	-0.23
b126	0.12	0.13	0.15	0.15	0.14	0.14	0.13	0.13	0.13	0.14	0.16	0.19

Table 5 (cont.).

	b61	b62	b63	b64	b65	b66	b67	b68	b69	b70	b71	b72
b61	1.00											
b62	0.99	1.00										
b63	0.11	0.12	1.00									
b64	0.21	0.23	0.60	1.00								
b65	0.44	0.46	0.53	0.67	1.00							
b66	-0.10	-0.10	0.00	0.00	0.00	1.00						
b67	-0.09	-0.09	-0.01	0.00	0.01	0.33	1.00					
b68	-0.06	-0.06	0.00	0.01	0.03	0.82	0.35	1.00				
b69	0.69	0.70	0.22	0.39	0.74	-0.01	0.01	0.04	1.00			
b70	0.72	0.73	0.20	0.36	0.72	-0.01	0.00	0.04	1.00	1.00		
b71	0.75	0.75	0.18	0.34	0.70	-0.02	0.00	0.03	0.99	1.00	1.00	
b72	0.77	0.78	0.18	0.34	0.69	-0.02	-0.01	0.03	0.99	1.00	1.00	1.00
b73	0.80	0.80	0.18	0.34	0.69	-0.03	-0.01	0.02	0.98	0.99	1.00	1.00
b74	0.82	0.82	0.17	0.33	0.68	-0.03	-0.02	0.02	0.97	0.98	0.99	1.00
b75	0.83	0.83	0.17	0.33	0.67	-0.03	-0.02	0.02	0.97	0.98	0.99	0.99
b76	0.84	0.84	0.17	0.33	0.66	-0.04	-0.02	0.01	0.96	0.97	0.98	0.99
b77	0.85	0.85	0.17	0.32	0.66	-0.04	-0.02	0.01	0.96	0.97	0.98	0.99
b78	0.86	0.86	0.17	0.32	0.66	-0.04	-0.03	0.01	0.95	0.96	0.98	0.98
b79	0.87	0.87	0.17	0.32	0.65	-0.04	-0.03	0.01	0.95	0.96	0.97	0.98
b80	0.87	0.87	0.17	0.32	0.65	-0.04	-0.03	0.01	0.94	0.96	0.97	0.98
b81	0.88	0.87	0.17	0.32	0.64	-0.04	-0.03	0.01	0.94	0.95	0.97	0.98
b82	0.87	0.87	0.17	0.32	0.64	-0.04	-0.03	0.01	0.94	0.95	0.97	0.98
b83	0.87	0.87	0.16	0.31	0.64	-0.04	-0.03	0.01	0.94	0.95	0.97	0.98
b84	0.87	0.87	0.17	0.32	0.64	-0.04	-0.03	0.01	0.94	0.95	0.97	0.98
b85	0.87	0.86	0.16	0.31	0.64	-0.04	-0.03	0.01	0.94	0.95	0.97	0.98
b86	0.86	0.86	0.16	0.32	0.65	-0.04	-0.02	0.01	0.95	0.96	0.97	0.98
b87	0.85	0.85	0.16	0.32	0.65	-0.04	-0.02	0.01	0.95	0.96	0.97	0.98
b88	0.84	0.84	0.16	0.32	0.65	-0.04	-0.02	0.01	0.95	0.96	0.98	0.98
b89	0.84	0.84	0.16	0.32	0.65	-0.04	-0.02	0.02	0.96	0.97	0.98	0.99
b90	0.83	0.83	0.16	0.32	0.66	-0.03	-0.02	0.02	0.96	0.97	0.98	0.99
b91	0.82	0.82	0.16	0.31	0.66	-0.03	-0.02	0.02	0.96	0.97	0.98	0.99
b92	0.81	0.81	0.16	0.31	0.66	-0.03	-0.02	0.02	0.97	0.98	0.99	0.99
b93	0.14	0.14	0.03	0.06	0.15	-0.01	0.22	0.00	0.21	0.21	0.21	0.22
b94	0.78	0.78	0.15	0.30	0.64	-0.03	-0.01	0.02	0.94	0.95	0.96	0.96
b95	0.26	0.29	0.35	0.47	0.68	0.03	0.03	0.06	0.71	0.68	0.66	0.64
b96	-0.20	-0.20	-0.02	-0.03	-0.04	0.41	0.34	0.51	-0.07	-0.08	-0.09	-0.09
b97	0.02	0.02	0.02	0.06	0.12	0.00	0.00	0.01	0.16	0.16	0.15	0.15
b98	-0.15	-0.15	-0.02	-0.01	-0.01	0.25	0.34	0.27	-0.02	-0.02	-0.03	-0.04
b99	0.11	0.12	0.06	0.11	0.23	0.32	0.01	0.35	0.31	0.31	0.30	0.29
b100	0.47	0.48	0.17	0.32	0.68	0.01	0.03	0.06	0.95	0.94	0.93	0.91
b101	0.49	0.50	0.17	0.33	0.69	0.01	0.03	0.06	0.95	0.95	0.94	0.92
b102	0.52	0.53	0.17	0.33	0.69	0.01	0.03	0.06	0.96	0.96	0.94	0.93
b103	0.54	0.54	0.17	0.33	0.68	0.01	0.02	0.06	0.96	0.96	0.95	0.94
b104	0.55	0.56	0.17	0.33	0.69	0.01	0.02	0.05	0.97	0.96	0.95	0.94
b105	0.56	0.57	0.17	0.33	0.68	0.00	0.02	0.05	0.97	0.96	0.96	0.95
b106	0.58	0.58	0.17	0.33	0.68	0.00	0.02	0.05	0.97	0.97	0.96	0.95
b107	0.59	0.59	0.17	0.33	0.69	0.00	0.02	0.05	0.97	0.97	0.97	0.96
b108	0.60	0.61	0.17	0.33	0.69	0.00	0.02	0.05	0.98	0.98	0.97	0.96
b109	0.62	0.63	0.17	0.34	0.69	0.00	0.01	0.05	0.98	0.98	0.98	0.97
b110	0.63	0.63	0.17	0.33	0.69	0.00	0.01	0.05	0.98	0.98	0.98	0.97
b111	0.63	0.63	0.17	0.33	0.69	0.00	0.01	0.05	0.98	0.98	0.98	0.97
b112	0.62	0.62	0.17	0.33	0.69	0.00	0.02	0.05	0.98	0.98	0.97	0.97
b113	0.60	0.60	0.17	0.34	0.69	0.00	0.02	0.05	0.97	0.97	0.97	0.96
b114	0.58	0.58	0.17	0.33	0.69	0.00	0.02	0.05	0.97	0.97	0.96	0.95

Table 5 (cont.).

	b61	b62	b63	b64	b65	b66	b67	b68	b69	b70	b71	b72
b115	0.56	0.57	0.17	0.33	0.69	0.01	0.02	0.05	0.97	0.96	0.96	0.95
b116	-0.08	-0.08	-0.01	0.00	0.03	0.23	0.11	0.12	0.03	0.03	0.02	0.02
b117	-0.07	-0.07	-0.01	0.00	0.03	0.25	0.00	0.13	0.03	0.03	0.03	0.02
b118	-0.16	-0.15	-0.01	-0.01	-0.02	0.17	0.34	0.18	-0.04	-0.04	-0.05	-0.05
b119	-0.23	-0.23	-0.03	-0.03	-0.05	0.38	0.25	0.26	-0.09	-0.10	-0.11	-0.11
b120	-0.20	-0.20	-0.01	-0.02	-0.03	0.14	0.21	0.14	-0.07	-0.08	-0.08	-0.09
b121	-0.27	-0.27	-0.04	-0.05	-0.08	0.44	0.38	0.34	-0.12	-0.13	-0.14	-0.15
b122	-0.22	-0.22	-0.01	-0.03	-0.05	0.19	0.12	0.20	-0.09	-0.10	-0.11	-0.11
b123	-0.26	-0.26	-0.04	-0.04	-0.07	0.28	0.34	0.29	-0.12	-0.13	-0.14	-0.14
b124	-0.26	-0.25	-0.04	-0.06	-0.11	0.17	0.28	0.13	-0.16	-0.16	-0.17	-0.18
b125	-0.23	-0.23	-0.06	-0.10	-0.18	0.03	0.02	0.02	-0.22	-0.23	-0.23	-0.23
b126	0.22	0.24	0.14	0.25	0.45	0.02	0.04	0.05	0.58	0.56	0.54	0.52

Table 5 (cont.).

	b73	b74	b75	b76	b77	b78	b79	b80	b81	b82	b83	b84
b73	1.00											
b74	1.00	1.00										
b75	1.00	1.00	1.00									
b76	1.00	1.00	1.00	1.00								
b77	0.99	1.00	1.00	1.00	1.00							
b78	0.99	1.00	1.00	1.00	1.00	1.00						
b79	0.99	0.99	1.00	1.00	1.00	1.00	1.00					
b80	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00				
b81	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00			
b82	0.98	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
b83	0.98	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
b84	0.98	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
b85	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
b86	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
b87	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
b88	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
b89	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
b90	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
b91	0.99	1.00	1.00	1.00	1.00	0.99	0.99	0.99	0.99	0.99	0.99	0.99
b92	1.00	1.00	1.00	1.00	1.00	0.99	0.99	0.99	0.99	0.99	0.99	0.99
b93	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
b94	0.97	0.97	0.97	0.97	0.97	0.96	0.96	0.96	0.96	0.96	0.96	0.96
b95	0.62	0.60	0.58	0.57	0.56	0.56	0.55	0.54	0.54	0.54	0.54	0.54
b96	-0.10	-0.10	-0.11	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12
b97	0.14	0.14	0.13	0.13	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11
b98	-0.04	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07
b99	0.28	0.28	0.27	0.26	0.26	0.26	0.25	0.25	0.25	0.25	0.25	0.25
b100	0.89	0.88	0.86	0.85	0.84	0.83	0.82	0.81	0.81	0.81	0.81	0.81
b101	0.91	0.89	0.88	0.86	0.85	0.84	0.84	0.83	0.83	0.83	0.83	0.83
b102	0.92	0.90	0.89	0.88	0.87	0.86	0.85	0.85	0.84	0.84	0.84	0.84
b103	0.92	0.91	0.90	0.89	0.88	0.87	0.86	0.86	0.85	0.85	0.86	0.86
b104	0.93	0.92	0.91	0.90	0.89	0.88	0.87	0.87	0.87	0.87	0.87	0.87
b105	0.94	0.92	0.91	0.90	0.90	0.89	0.88	0.88	0.87	0.87	0.88	0.88
b106	0.94	0.93	0.92	0.91	0.90	0.90	0.89	0.89	0.88	0.88	0.88	0.89
b107	0.95	0.94	0.93	0.92	0.91	0.90	0.90	0.89	0.89	0.89	0.89	0.89
b108	0.95	0.94	0.94	0.93	0.92	0.91	0.91	0.90	0.90	0.90	0.90	0.90
b109	0.96	0.95	0.94	0.94	0.93	0.92	0.92	0.91	0.91	0.91	0.91	0.91
b110	0.96	0.95	0.95	0.94	0.93	0.93	0.92	0.92	0.91	0.91	0.92	0.92
b111	0.96	0.95	0.95	0.94	0.93	0.92	0.92	0.91	0.91	0.91	0.91	0.92
b112	0.96	0.95	0.94	0.93	0.92	0.92	0.91	0.91	0.91	0.91	0.91	0.91
b113	0.95	0.94	0.93	0.92	0.91	0.91	0.90	0.90	0.89	0.89	0.89	0.90
b114	0.94	0.93	0.92	0.91	0.90	0.90	0.89	0.89	0.88	0.88	0.88	0.89
b115	0.93	0.92	0.91	0.90	0.89	0.89	0.88	0.88	0.87	0.87	0.87	0.88
b116	0.01	0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
b117	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
b118	-0.06	-0.06	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08
b119	-0.12	-0.12	-0.13	-0.13	-0.14	-0.14	-0.14	-0.14	-0.15	-0.14	-0.14	-0.14
b120	-0.10	-0.10	-0.11	-0.11	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12
b121	-0.15	-0.16	-0.16	-0.17	-0.17	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18
b122	-0.12	-0.12	-0.13	-0.13	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14
b123	-0.15	-0.16	-0.16	-0.17	-0.17	-0.17	-0.17	-0.18	-0.18	-0.18	-0.18	-0.18
b124	-0.18	-0.19	-0.19	-0.19	-0.19	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20
b125	-0.23	-0.24	-0.24	-0.24	-0.24	-0.24	-0.24	-0.24	-0.24	-0.24	-0.24	-0.24
b126	0.51	0.49	0.48	0.47	0.46	0.46	0.45	0.44	0.44	0.44	0.44	0.44

Table 5 (cont.).

	b85	b86	b87	b88	b89	b90	b91	b92	b93	b94	b95	b96
b85	1.00											
b86	1.00	1.00										
b87	1.00	1.00	1.00									
b88	1.00	1.00	1.00	1.00								
b89	1.00	1.00	1.00	1.00	1.00							
b90	1.00	1.00	1.00	1.00	1.00	1.00						
b91	1.00	1.00	1.00	1.00	1.00	1.00	1.00					
b92	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00				
b93	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	1.00			
b94	0.96	0.96	0.97	0.97	0.97	0.97	0.97	0.97	0.21	1.00		
b95	0.54	0.55	0.56	0.56	0.57	0.57	0.58	0.58	0.14	0.56	1.00	
b96	-0.12	-0.11	-0.11	-0.11	-0.11	-0.11	-0.10	-0.10	-0.03	-0.10	0.00	1.00
b97	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.14	0.03	0.13	0.15	0.14
b98	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	0.17	-0.04	0.03	0.32
b99	0.25	0.26	0.26	0.26	0.26	0.27	0.27	0.27	0.06	0.27	0.26	0.19
b100	0.82	0.83	0.84	0.84	0.85	0.86	0.87	0.88	0.20	0.86	0.73	-0.03
b101	0.84	0.84	0.85	0.86	0.87	0.87	0.88	0.89	0.20	0.87	0.74	-0.03
b102	0.85	0.86	0.87	0.87	0.88	0.89	0.89	0.90	0.21	0.88	0.74	-0.04
b103	0.86	0.87	0.88	0.88	0.89	0.90	0.91	0.91	0.21	0.89	0.72	-0.04
b104	0.87	0.88	0.89	0.90	0.90	0.91	0.91	0.92	0.21	0.90	0.72	-0.04
b105	0.88	0.89	0.90	0.90	0.91	0.92	0.92	0.93	0.21	0.90	0.71	-0.04
b106	0.89	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.21	0.91	0.71	-0.05
b107	0.90	0.91	0.91	0.92	0.92	0.93	0.94	0.94	0.21	0.92	0.71	-0.05
b108	0.91	0.92	0.92	0.93	0.93	0.94	0.94	0.95	0.21	0.92	0.70	-0.05
b109	0.92	0.93	0.93	0.94	0.94	0.95	0.95	0.95	0.21	0.93	0.70	-0.06
b110	0.92	0.93	0.93	0.94	0.94	0.95	0.95	0.96	0.21	0.93	0.70	-0.06
b111	0.92	0.93	0.93	0.94	0.94	0.95	0.95	0.95	0.21	0.93	0.70	-0.06
b112	0.91	0.92	0.93	0.93	0.94	0.94	0.95	0.95	0.21	0.93	0.70	-0.05
b113	0.90	0.91	0.92	0.92	0.93	0.93	0.94	0.94	0.21	0.92	0.71	-0.05
b114	0.89	0.90	0.91	0.91	0.92	0.92	0.93	0.93	0.21	0.91	0.71	-0.05
b115	0.88	0.89	0.90	0.90	0.91	0.91	0.92	0.92	0.21	0.90	0.72	-0.04
b116	-0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.24	0.01	0.05	0.21
b117	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.02	0.06	0.15
b118	-0.08	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	0.16	-0.06	0.01	0.32
b119	-0.14	-0.14	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12	0.10	-0.11	-0.01	0.36
b120	-0.12	-0.11	-0.11	-0.11	-0.11	-0.10	-0.10	-0.10	0.12	-0.09	0.01	0.31
b121	-0.18	-0.17	-0.17	-0.17	-0.17	-0.16	-0.16	-0.16	0.07	-0.15	-0.03	0.41
b122	-0.14	-0.14	-0.13	-0.13	-0.13	-0.13	-0.13	-0.12	0.11	-0.11	-0.01	0.33
b123	-0.17	-0.17	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16	0.08	-0.15	-0.03	0.32
b124	-0.20	-0.19	-0.19	-0.19	-0.19	-0.18	-0.18	-0.18	0.10	-0.17	-0.07	0.38
b125	-0.24	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23	-0.03	-0.23	-0.12	0.07
b126	0.44	0.46	0.46	0.47	0.47	0.48	0.48	0.48	0.11	0.47	0.56	0.02

Table 5 (cont.).

	b97	b98	b99	b100	b101	b102	b103	b104	b105	b106	b107	b108
b97	1.00											
b98	0.18	1.00										
b99	0.07	0.01	1.00									
b100	0.19	0.02	0.33	1.00								
b101	0.19	0.02	0.33	1.00	1.00							
b102	0.19	0.02	0.33	1.00	1.00	1.00						
b103	0.19	0.01	0.33	0.99	1.00	1.00	1.00					
b104	0.18	0.01	0.33	0.99	1.00	1.00	1.00	1.00				
b105	0.18	0.01	0.33	0.99	0.99	1.00	1.00	1.00	1.00			
b106	0.18	0.01	0.32	0.98	0.99	0.99	1.00	1.00	1.00	1.00		
b107	0.18	0.00	0.32	0.98	0.99	0.99	1.00	1.00	1.00	1.00	1.00	
b108	0.18	0.00	0.32	0.98	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00
b109	0.17	0.00	0.32	0.98	0.98	0.99	0.99	0.99	1.00	1.00	1.00	1.00
b110	0.17	0.00	0.32	0.97	0.98	0.99	0.99	0.99	1.00	1.00	1.00	1.00
b111	0.17	0.00	0.32	0.97	0.98	0.99	0.99	0.99	1.00	1.00	1.00	1.00
b112	0.17	0.00	0.32	0.98	0.98	0.99	0.99	0.99	1.00	1.00	1.00	1.00
b113	0.18	0.00	0.32	0.98	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00
b114	0.18	0.01	0.32	0.98	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00
b115	0.18	0.01	0.33	0.98	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00
b116	0.01	0.27	0.02	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.04
b117	0.01	0.29	0.02	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05
b118	0.18	0.26	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02
b119	0.26	0.44	0.17	-0.04	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.07	-0.07
b120	0.15	0.33	0.20	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05
b121	-0.01	0.51	-0.03	-0.07	-0.08	-0.08	-0.08	-0.09	-0.09	-0.09	-0.10	-0.10
b122	0.27	0.20	0.17	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.07	-0.07	-0.07
b123	0.11	0.35	-0.03	-0.07	-0.08	-0.08	-0.08	-0.09	-0.09	-0.09	-0.10	-0.10
b124	0.05	0.24	0.06	-0.11	-0.11	-0.12	-0.12	-0.12	-0.13	-0.13	-0.13	-0.13
b125	0.03	0.11	-0.07	-0.18	-0.18	-0.19	-0.19	-0.19	-0.19	-0.19	-0.20	-0.20
b126	0.12	0.05	0.22	0.61	0.62	0.62	0.61	0.61	0.60	0.60	0.59	0.59

Table 5 (cont.).

	b109	b110	b111	b112	b113	b114	b115	b116	b117	b118	b119	b120
b109	1.00											
b110	1.00	1.00										
b111	1.00	1.00	1.00									
b112	1.00	1.00	1.00	1.00								
b113	1.00	1.00	1.00	1.00	1.00							
b114	1.00	1.00	1.00	1.00	1.00	1.00						
b115	0.99	0.99	0.99	1.00	1.00	1.00	1.00					
b116	0.04	0.04	0.04	0.04	0.04	0.05	0.05	1.00				
b117	0.05	0.04	0.05	0.05	0.05	0.05	0.05	0.40	1.00			
b118	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	0.27	0.09	1.00		
b119	-0.07	-0.08	-0.07	-0.07	-0.07	-0.06	-0.06	0.47	0.36	0.39	1.00	
b120	-0.06	-0.06	-0.06	-0.05	-0.05	-0.04	-0.04	0.07	0.16	0.33	0.37	1.00
b121	-0.10	-0.10	-0.10	-0.10	-0.10	-0.09	-0.09	0.34	0.37	0.47	0.48	0.36
b122	-0.08	-0.08	-0.08	-0.07	-0.07	-0.07	-0.06	0.35	0.22	0.36	0.53	0.34
b123	-0.10	-0.10	-0.10	-0.10	-0.09	-0.09	-0.09	0.24	0.32	0.40	0.53	0.37
b124	-0.14	-0.14	-0.14	-0.14	-0.13	-0.13	-0.12	0.18	0.19	0.30	0.30	0.27
b125	-0.20	-0.21	-0.20	-0.20	-0.20	-0.19	-0.19	0.08	0.07	0.06	0.14	0.10
b126	0.59	0.58	0.58	0.59	0.60	0.60	0.61	0.04	0.05	0.01	-0.01	0.02

Table 5 (cont.).

	b121	b122	b123	b124	b125	b126
b121	1.00					
b122	0.50	1.00				
b123	0.63	0.41	1.00			
b124	0.37	0.30	0.29	1.00		
b125	0.13	0.16	0.12	0.13	1.00	
b126	-0.01	-0.02	-0.01	-0.04	-0.09	1.00

Table 6. Selected latent roots of the correlation matrix for the hyperspectral image data

Latent Roots	Latent roots	% variance
1	76.8	60.9
2	23.7	18.8
3	4.55	3.61
4	4.10	3.25
5	1.83	1.45
6	1.74	1.38
7	1.31	1.04
8	1.26	1.00
9	1.01	0.80
10	0.92	0.73

This part of the analysis is at an early stage. We are now exploring ways of improving the PCA to obtain more refined information about which bands are likely to provide relevant spatial information. The correlations between the original wavebands and the principal components have been computed and those bands with correlations greater than 0.9 on the first 5 components only have been retained for a further PCA. This part of the work will be given in detail in the next interim report.

Table 8. Fitted variogram models for principal components (PC) 1 to 4.

Variable	Model	Model parameters				
		c_0	c_1	c_2	a_1	a_2
PC 1	Double spherical	25.32	19.02	33.18	3.716	20.36
PC 2	Double spherical	8.318	6.918	7.536	4.944	14.26
PC 3	Double spherical	1.951	1.445	1.335	4.683	10.81
PC 4	Double spherical	1.940	0.8951	0.7950	3.939	13.67

Note: c_0 is the nugget variance c_1 and c_2 the sills of the autocorrelated variance and a_1 and a_2 the range of spatial dependence.

Table 7. Latent vectors of selected latent roots of the correlation matrix for the hyperspectral image data

	PC 1	PC 2	PC 3	PC 4	PC 5
b1	0.089	-0.071	0.019	0.162	0.094
b2	0.089	-0.099	0.029	0.157	0.040
b3	0.090	-0.102	0.028	0.148	0.032
b4	0.091	-0.103	0.026	0.141	0.027
b5	0.092	-0.102	0.022	0.136	0.021
b6	0.096	-0.092	0.014	0.144	0.020
b7	0.100	-0.066	-0.003	0.161	0.019
b8	0.102	-0.051	-0.015	0.165	0.017
b9	0.103	-0.052	-0.021	0.155	0.018
b10	0.102	-0.069	-0.018	0.135	0.010
b11	0.101	-0.079	-0.010	0.117	0.003
b12	0.102	-0.083	-0.001	0.101	0.003
b13	0.101	-0.087	0.003	0.085	0.004
b14	0.101	-0.091	0.008	0.072	-0.009
b15	0.100	-0.095	0.016	0.056	-0.007
b16	0.099	-0.098	0.022	0.043	-0.008
b17	0.101	-0.093	0.020	0.038	-0.007
b18	0.110	-0.029	0.002	0.077	-0.005
b19	0.102	-0.069	-0.018	0.135	0.010
b20	0.101	-0.079	-0.010	0.117	0.003
b21	0.102	-0.083	-0.001	0.101	0.003
b22	0.101	-0.087	0.003	0.085	0.004
b23	0.101	-0.091	0.008	0.072	-0.009
b24	0.100	-0.095	0.016	0.056	-0.007
b25	0.099	-0.098	0.022	0.043	-0.008
b26	0.101	-0.093	0.020	0.038	-0.007
b27	0.110	-0.029	0.002	0.077	-0.005
b28	0.102	-0.069	-0.018	0.135	0.010
b29	0.101	-0.079	-0.010	0.117	0.003
b30	0.102	-0.083	-0.001	0.101	0.003
b31	0.101	-0.087	0.003	0.085	0.004
b32	0.101	-0.091	0.008	0.072	-0.009
b33	0.100	-0.095	0.016	0.056	-0.007
b34	0.099	-0.098	0.022	0.043	-0.008
b35	0.101	-0.093	0.020	0.038	-0.007
b36	0.110	-0.029	0.002	0.077	-0.005
b37	0.061	0.165	-0.037	0.115	0.025
b38	0.061	0.166	-0.036	0.113	0.029
b39	0.060	0.167	-0.035	0.112	0.032
b40	0.059	0.168	-0.033	0.115	0.031
b41	0.058	0.169	-0.033	0.116	0.029
b42	0.057	0.170	-0.032	0.115	0.029
b43	0.057	0.170	-0.031	0.114	0.027
b44	0.058	0.170	-0.031	0.110	0.029
b45	0.059	0.169	-0.030	0.104	0.030
b46	0.061	0.167	-0.030	0.097	0.031
b47	0.066	0.162	-0.033	0.084	0.016
b48	0.072	0.156	-0.034	0.065	0.007
b49	0.075	0.151	-0.035	0.053	0.002
b50	0.077	0.150	-0.035	0.047	0.003
b51	0.078	0.148	-0.034	0.039	0.007
b52	0.078	0.148	-0.034	0.038	0.004

Table 7 (cont.).

Band	PC 1	PC 2	PC 3	PC 4	PC 5
b53	0.077	0.149	-0.033	0.039	0.003
b54	0.076	0.151	-0.031	0.039	0.006
b55	0.076	0.152	-0.030	0.038	0.008
b56	0.076	0.152	-0.029	0.037	0.006
b57	0.076	0.152	-0.028	0.035	0.003
b58	0.077	0.150	-0.027	0.029	0.003
b59	0.079	0.147	-0.027	0.020	0.001
b60	0.082	0.141	-0.027	0.008	-0.001
b61	0.086	0.134	-0.026	-0.006	0.001
b62	0.086	0.130	-0.025	-0.015	0.013
b63	0.020	-0.006	0.024	-0.076	0.596
b64	0.038	-0.010	0.021	-0.105	0.562
b65	0.077	-0.021	0.019	-0.130	0.380
b66	-0.002	-0.038	-0.272	-0.025	0.136
b67	-0.001	-0.036	-0.228	-0.018	0.033
b68	0.003	-0.036	-0.258	-0.029	0.141
b69	0.110	-0.011	0.010	-0.121	0.016
b70	0.110	-0.004	0.006	-0.118	-0.008
b71	0.111	0.005	0.002	-0.114	-0.021
b72	0.111	0.013	-0.002	-0.112	-0.024
b73	0.110	0.021	-0.005	-0.109	-0.024
b74	0.110	0.027	-0.008	-0.106	-0.026
b75	0.110	0.033	-0.010	-0.102	-0.029
b76	0.109	0.038	-0.012	-0.101	-0.026
b77	0.109	0.042	-0.013	-0.099	-0.026
b78	0.109	0.045	-0.014	-0.099	-0.023
b79	0.108	0.048	-0.015	-0.098	-0.025
b80	0.108	0.050	-0.016	-0.097	-0.027
b81	0.108	0.051	-0.016	-0.096	-0.025
b82	0.108	0.051	-0.016	-0.094	-0.027
b83	0.108	0.051	-0.017	-0.093	-0.029
b84	0.108	0.050	-0.016	-0.093	-0.026
b85	0.108	0.047	-0.016	-0.091	-0.035
b86	0.109	0.044	-0.016	-0.093	-0.032
b87	0.109	0.041	-0.015	-0.092	-0.034
b88	0.109	0.038	-0.014	-0.093	-0.035
b89	0.110	0.036	-0.013	-0.096	-0.035
b90	0.110	0.033	-0.012	-0.098	-0.038
b91	0.110	0.030	-0.010	-0.098	-0.043
b92	0.110	0.027	-0.009	-0.101	-0.044
b93	0.024	-0.009	-0.100	-0.035	-0.067
b94	0.107	0.025	-0.010	-0.101	-0.050
b95	0.073	-0.070	0.039	-0.115	0.225
b96	-0.010	-0.053	-0.270	-0.020	0.060
b97	0.017	-0.034	-0.074	-0.027	-0.051
b98	-0.004	-0.051	-0.260	-0.016	-0.019
b99	0.033	-0.037	-0.080	-0.055	0.081
b100	0.104	-0.067	0.034	-0.096	-0.032
b101	0.106	-0.063	0.031	-0.090	-0.025
b102	0.107	-0.058	0.028	-0.085	-0.023
b103	0.108	-0.054	0.025	-0.080	-0.030
b104	0.109	-0.050	0.023	-0.080	-0.029
b105	0.109	-0.047	0.021	-0.079	-0.033
b106	0.109	-0.044	0.020	-0.082	-0.034

Table 7 (cont.).

Band	PC 1	PC 2	PC 3	PC 4	PC 5
b107	0.110	-0.040	0.018	-0.085	-0.035
b108	0.110	-0.036	0.017	-0.090	-0.037
b109	0.110	-0.032	0.015	-0.097	-0.033
b110	0.110	-0.030	0.014	-0.097	-0.035
b111	0.110	-0.031	0.014	-0.095	-0.036
b112	0.110	-0.033	0.015	-0.091	-0.033
b113	0.110	-0.038	0.017	-0.085	-0.029
b114	0.109	-0.043	0.018	-0.082	-0.031
b115	0.109	-0.046	0.019	-0.085	-0.028
b116	0.002	-0.038	-0.217	-0.016	-0.051
b117	0.003	-0.036	-0.189	-0.012	-0.033
b118	-0.005	-0.047	-0.248	-0.011	-0.034
b119	-0.012	-0.061	-0.317	-0.011	-0.018
b120	-0.010	-0.052	-0.214	-0.011	-0.008
b121	-0.016	-0.066	-0.332	-0.008	-0.008
b122	-0.012	-0.056	-0.257	-0.011	-0.027
b123	-0.016	-0.062	-0.290	-0.006	-0.016
b124	-0.019	-0.048	-0.204	0.001	-0.025
b125	-0.025	-0.023	-0.055	0.039	-0.054
b126	0.061	-0.060	0.026	-0.066	0.059

Appendix

```
C **** PROGRAM TO COMPUTE MOVING AVERAGES AND VARIANCES FOR SQUARES
       OF VARIOUS SIZES
C **** R WEBSTER    ROTHAMSTED
C      Latest version 22 July 1999
C
C     This program was written as part of US project
C     and may be handed over to TEC.
C
C     Program reads data on a grid with X and Y coordinates
C       and converts them to an array for the selected variate
C       with implied coordinates.
C
      DIMENSION ZK(190,189), ZA(30), VM(190,189), AM(190,189)
C **** ZK( , ) will hold grid of data.
      character*72 TITLE(2)
      character*72 INFILE, OP12, IN11, FDAT
      data MAXROW, MAXCOL/190,189/
      data IN,INDAT,LP/10,11,12/
      PRINT * ,  'WHAT IS THE NAME OF THE STEERING FILE ?'
      READ (5,'(A)') INFILE
      OPEN (INDAT,FILE=INFILE,STATUS='OLD')
      print * , 'WHAT IS THE NAME OF THE DATA FILE ? '
      read (5,'(a)') IN11
      open (IN,file=IN11,status='OLD')
      PRINT *,'WHAT DO YOU WANT TO CALL THE MAIN OUTPUT FILE ?'
      READ (5,'(A)') OP12
      OPEN (LP,FILE=OP12,STATUS='NEW')
C      PRINT *,'WHAT DO YOU WANT TO CALL THE SECOND RESULTS FILE ?'
       READ (5,'(A)') OP12
C      OPEN (LF8,FILE=OP12,STATUS='NEW')
      READ (INDAT,10) TITLE
      WRITE (LP,10) TITLE
       WRITE (LF8,12) TITLE
   10 FORMAT (A)
       NVAR  = int(CYNPUT(INDAT)+0.1)
       NSEL  = int(CYNPUT(INDAT)+0.1)
       MSIDE = int(CYNPUT(INDAT)+0.1)
       ZMIS  = CYNPUT(INDAT)
       ILOG  = int(CYNPUT(INDAT)+0.1)
       if (ILOG.eq.1) SHIFT=CYNPUT(INDAT)
C ****  NVAR is number of variates in file.
        NSEL is the one selected for analysis.
        MSIDE is the side of the square within which
C                 averages are computed.
C       ZMIS is the value used for missing or blank.
        ILOG = 1 to transform to log to base 10.
C       SHIFT is a value to be added to data to shift the origin
C             before taking logarithms.
  **** Set data grid to blank
       if (ILOG.eq.1) ZMIS=log10(ZMIS)
      do 20 I=1,MAXROW
         do 20 J=1,MAXCOL
            ZK(I,J)=ZMIS-10000.0
   20 continue
C
      read (INDAT,10) FDAT
C **** Read the data.
   35 NC=0
      NROW=0
      NCOL=0
   36 NC=NC+1
         read (IN,FDAT,end=45) ICOL, IROW, (ZA(J), J=1,NVAR)
         if (ICOL.gt.MAXCOL) then
            write (LP,38) ICOL
```

```
            stop
         endif
         if (IROW.gt.MAXROW) then
            write (LP,39) IROW
            stop
         endif
 38      format (/10x,'ICOL exceeds array bound'//)
 39      format (/10x,'IROW exceeds array bound'//)
         if (NROW.lt.IROW) NROW=IROW
         if (NCOL.lt.ICOL) NCOL=ICOL
         ZL=ZA(NSEL)
         if (ILOG.eq.1) then
            if (ZL.gt.0.01) then
               ZL=log10(ZL+SHIFT)
            else
               ZL=ZMIS-100000.0
            endif
         endif
         ZK(IROW,ICOL)=ZL
         goto 36
 45   continue
      NC=NC-1
      write (LP,47) NC, NROW, NCOL
 47   format(// 10x, 'Number of data      ',i10/
     1          10x, 'Number of rows      ',i10/
     2          10x, 'Number of columns   ',i10/)
      if (ILOG.eq.1) write (LP, 51) SHIFT
 51   format (/10x,'DATA TRANSFORMED TO LOG TO BASE 10'/
     1          10x,'SHIFT ',F10.3/)
      ZMAX=-99999999
      ZMIN=999999999
      NN=NC
      ZBAR=0.0
      SSQ=0.0
      COUNT=0.0
      do 54 I=1,NROW
         do 53 J=1,NCOL
            ZZ=ZK(I,J)
            if (ZZ.le.ZMIS) goto 53
               if (ZMAX.lt.ZZ) ZMAX=ZZ
               if (ZMIN.gt.ZZ) ZMIN=ZZ
               DIF=ZZ-ZBAR
               COUNT=COUNT+1.0
               ZBAR=ZBAR+DIF/COUNT
               SSQ=SSQ+(1.0-1.0/COUNT)*DIF*DIF
 53      continue
 54   CONTINUE
      A3=0.0
      do 57 I=1,NROW
         do 56 J=1,NCOL
            ZZ=ZK(I,J)
            if (ZZ.le.ZMIS) goto 56
               A3=A3+(ZZ-ZBAR)**3
 56      continue
 57   CONTINUE
      A2=SSQ/COUNT
      A3=(A3/COUNT)/(A2*sqrt(A2))
      VAR=SSQ/(COUNT-1.0)
      STD=sqrt(VAR)
      write (LP, 58) COUNT, ZMIN, ZMAX, ZBAR, VAR, STD, A3
 58   format (//,10X, ' Count                  ',f10.1/
     1           10x, ' Minimum                ',f10.4/
     1           10x, ' Maximum                ',f10.4/
     1           10x, ' Mean                   ',f10.4/
```

```
   2            10x, ' Variance          ',f12.6/
   3            10x, ' Standard deviation ',f10.4/
   4            10x, ' Skewness           ',f10.4/)
C
**** Enter means and variances into arrays VM( , ) and AM( , ).
      do 122 I=1,MAXROW
         do 122 J=1,MAXCOL
            AM(I,J)=ZBAR
            VM(I,J)=VAR
122 continue
C**** Now start computing moving averages and moving variances.
     Data are in array ZK( , ) with NCOL columns and NROW rows.
      M=MSIDE
      NRM=NROW-M-1
      NCM=NCOL-M-1
      do 200 KR=1,NRM
         do 200 KC=1,NCM
C**** Initialize counters
            COUNT=0.0
            SUM=0.0
            SSQ=0.0
**** Loop through each square in turn
            KRS=KR
            KRE=KR+M-1
            KCS=KC
            KCE=KC+M-1
            do 145 I=KRS,KRE
               do 145 J=KCS,KCE
                  ZZ=ZK(I,J)
                  if (ZZ.lt.ZMIS) goto 145
                  COUNT=COUNT+1.0
                  DIF=ZZ-SUM
                  SUM=SUM+DIF/COUNT
                  SSQ=SSQ+(1.0-1.0/COUNT)*DIF*DIF
145         continue
            SSQ=SSQ/(COUNT-1.0)
            SDV=sqrt(SSQ)
            KOR=KRS+(M+1)/2
            KOC=KCS+(M+1)/2
            VM(KOR,KOC)=SSQ
            AM(KOR,KOC)=SUM
200 continue
      write (LP,233)
      do 224 I=1,NROW
         write (LP, 230) (AM(I,J), J=1,NCOL)
224 continue
      write (LP,238)
      do 225 I=1,NROW
         write (LP, 231) (VM(I,J), J=1,NCOL)
225 continue
226 format (//)
230 format (2x,f9.4)
231 format (2x,f10.5)
233 format (//10x, 'MOVING AVERAGES '/)
238 format (//10x, 'MOVING VARIANCES '/)
      stop
      end
C
      FUNCTION CYNPUT(IN)
**** READS A REAL NUMBER FROM AN 80-BYTE RECORD IN FREE FORMAT
      DIMENSION K(80),NUM(10)
      DATA NUM/1H0,1H1,1H2,1H3,1H4,1H5,1H6,1H7,1H8,1H9/
      DATA INOLD,N,IFL,NPLUS,MINUS,NDOT/0,81,0,1H+,1H-,1H./
      CYNPUT=-0.0
```

```
      IF(INOLD.EQ.IN.AND. N.LE.80) GOTO 20
    5 IF(IFL.NE.0) RETURN
      INOLD=IN
      READ(IN,10) (K(I),I=1,80)
   10 FORMAT(80A1)
   15 N=1
   20 IF(N.GT.80) GOTO 35
      DO 30 I=N,80
        II=K(I)
        DO 25 J=1,10
          IF(II.EQ.NUM(J)) GOTO 40
   25   CONTINUE
        IF(II.EQ.MINUS) GOTO 40
        IF(II.EQ.NDOT) GOTO 40
        IF(II.EQ.NPLUS) GOTO 40
   30 CONTINUE
   35 GOTO 5
   40 SIGN=1.0
      IF(II.EQ.MINUS) SIGN=-1.0
      IF(II.EQ.MINUS .OR. II.EQ.NPLUS) I=I+1
      IF(I.GT.80) GOTO 60
      DO 55 N=I,80
        NN=K(N)
        IF(NN.EQ.NDOT)GOTO 70
        DO 45 J=1,10
          KK=J-1
          IF(NN.EQ.NUM(J)) GOTO 50
   45   CONTINUE
        GOTO 65
   50   CYNPUT=10.0*CYNPUT+KK
   55 CONTINUE
   60 N=82
   65 CYNPUT=SIGN*CYNPUT
      RETURN
   70 I=N+1
      TENS=1.0
      IF(I.GT.80) GOTO 90
      DO 85 N=I,80
        NN=K(N)
        DO 75 J=1,10
          KK=J-1
          IF(NN.EQ.NUM(J)) GOTO 80
   75   CONTINUE
        GOTO 65
   80   TENS=TENS*0.1
        CYNPUT=CYNPUT+TENS*KK
   85 CONTINUE
   90 N=82
      GOTO 65
      END
```

```
C **** PROGRAM TO COMPUTE VARIOGRAMS FOR SQUARES OF VARIOUS SIZES
C
C **** R WEBSTER    ROTHAMSTED
C       Latest version 22 July 1999
C
C     This program was written as part of US project
C     and may be handed over to TEC.
C
C     Program reads data on a grid with X and Y coordinates
C       and converts them to an array for the selected variate
C       with implied coordinates.
C
C     It tiles the grid into non-overlapping squares of
C        given side.   Any points to the bottom or right
C        of the grid left over play no role.
C
      DIMENSION ZK(190,189), GRID(30,30), ZA(30)
      real WT(30), GAM(30), WLAG(30)
C **** ZK( , ) will hold grid of data.
      character*72 TITLE(2)
      character*72 INFILE, OP12, IN11, OPGAM, FDAT
      data MAXROW, MAXCOL/190,189/
      data IN,INDAT,LP,LF8/10,11,12,13/
      PRINT * ,   'WHAT IS THE NAME OF THE STEERING FILE ?'
      READ (5,'(A)') INFILE
      OPEN (INDAT,FILE=INFILE,STATUS='OLD')
      print * , 'WHAT IS THE NAME OF THE DATA FILE ? '
      read (5,'(a)') IN11
      open (IN,file=IN11,status='OLD')
      PRINT *,'WHAT DO YOU WANT TO CALL THE MAIN OUTPUT FILE ?'
      READ (5,'(A)') OP12
      OPEN (LP,FILE=OP12,STATUS='NEW')
      PRINT *,'WHAT DO YOU WANT TO CALL THE FILE OF VARIOGRAMS?'
      READ (5,'(A)') OPGAM
      OPEN (LF8,FILE=OPGAM,STATUS='NEW')
C
      READ (INDAT,10) TITLE
      WRITE (LP,10) TITLE
C      WRITE (LF8,12) TITLE
   10 FORMAT (A)
       NVAR  = int(CYNPUT(INDAT)+0.1)
       NSEL  = int(CYNPUT(INDAT)+0.1)
       MSIDE = int(CYNPUT(INDAT)+0.1)
       MAXLAG= int(CYNPUT(INDAT)+0.1)
       ZMIS  = CYNPUT(INDAT)
       ILOG  = int(CYNPUT(INDAT)+0.1)
       if (ILOG.eq.1) SHIFT=CYNPUT(INDAT)
C ****  NVAR is number of variates in file.
C       NSEL is the one selected for analysis.
C       MSIDE is the side of the square within which
C                 averages are computed.
C       MAXLAG is the maximum lag distance of variograms
C       ZMIS is the value used for missing or blank.
C       ILOG = 1 to transform to log to base 10.
C       SHIFT is a value to be added to data to shift the origin
C             before taking logarithms.
C **** Set data grid to blank
C      if (ILOG.eq.1) ZMIS=log10(ZMIS)
      do 20 I=1,MAXROW
         do 20 J=1,MAXCOL
            ZK(I,J)=ZMIS-10000.0
   20 continue

      read (INDAT,10) FDAT
```

```
C **** Read the data.
  35 NC=0
     NROW=0
     NCOL=0
  36 NC=NC+1
        read (IN,FDAT,end=45) ICOL, IROW, (ZA(J), J=1,NVAR)
        if (ICOL.gt.MAXCOL) then
           write (LP,38) ICOL
           stop
        endif
        if (IROW.gt.MAXROW) then
           write (LP,39) IROW
           stop
        endif
  38    format (/10x,'ICOL exceeds array bound'//)
  39    format (/10x,'IROW exceeds array bound'//)
        if (NROW.lt.IROW) NROW=IROW
        if (NCOL.lt.ICOL) NCOL=ICOL
        ZL=ZA(NSEL)
        if (ILOG.eq.1) then
           if (ZL.gt.0.01) then
              ZL=log10(ZL+SHIFT)
           else
              ZL=ZMIS-100000.0
           endif
        endif
        ZK(IROW,ICOL)=ZL
        goto 36
  45 continue
     NC=NC-1
     write (LP,47) NC, NROW, NCOL
 47  format(// 10x, 'Number of data       ',i10/
    1          10x, 'Number of rows       ',i10/
    2          10x, 'Number of columns    ',i10/)
     if (ILOG.eq.1) write (LP, 51) SHIFT
  51 format (/10x,'DATA TRANSFORMED TO LOG TO BASE 10'/
    1         10x,'SHIFT ',F10.3/)
     ZMAX=-99999999
     ZMIN=999999999
     NN=NC
     ZBAR=0.0
     SSQ=0.0
     COUNT=0.0
     do 54 I=1,NROW
        do 53 J=1,NCOL
           ZZ=ZK(I,J)
           if (ZZ.le.ZMIS) goto 53
              if (ZMAX.lt.ZZ) ZMAX=ZZ
              if (ZMIN.gt.ZZ) ZMIN=ZZ
              DIF=ZZ-ZBAR
              COUNT=COUNT+1.0
              ZBAR=ZBAR+DIF/COUNT
              SSQ=SSQ+(1.0-1.0/COUNT)*DIF*DIF
  53    continue
  54 CONTINUE
     A3=0.0
     do 57 I=1,NROW
        do 56 J=1,NCOL
           ZZ=ZK(I,J)
           if (ZZ.le.ZMIS) goto 56
              A3=A3+(ZZ-ZBAR)**3
  56    continue
  57 CONTINUE
     A2=SSQ/COUNT
```

```
      A3=(A3/COUNT)/(A2*sqrt(A2))
      VAR=SSQ/(COUNT-1.0)
      STD=sqrt(VAR)
      write (LP, 58) COUNT, ZMIN, ZMAX, ZBAR, VAR, STD, A3
   58 format (//,10X, ' Count                ',f10.1/
     1           10x, ' Minimum              ',f10.4/
     1           10x, ' Maximum              ',f10.4/
     1           10x, ' Mean                 ',f10.4/
     2           10x, ' Variance             ',f12.6/
     3           10x, ' Standard deviation ',f10.4/
     4           10x, ' Skewness             ',f10.4/)

 **** Compute starting in top left corner of grid.
      NTILER=int(NROW/MSIDE)
      NTILEC=int(NCOL/MSIDE)

      do 300 IR=1,NTILER
         IRS=(IR-1)*MSIDE+1
         IRE=IR*MSIDE
         do 300 IC=1,NTILEC
            ICS=(IC-1)*MSIDE+1
            ICE=IC*MSIDE
            II=0
            do 210 I=IRS,IRE
               JJ=0
               II=II+1
               do 210 J=ICS,ICE
                  JJ=JJ+1
                  GRID(II,JJ)=ZK(I,J)
 210        continue
C **** Data are now transferred into array GRID( , ) covering
       a small square of side MSIDE.
       Initialize accumulators.
      do 220 I=1,MAXLAG
          WLAG(I)=0.0
          GAM(I)=0.0
          WT(I)=0.0
          SUM=0.0
          SSQ=0.0
          COUNT=0.0
 220 continue
      do 225 I=1,MSIDE
         do 225 J=1,MSIDE
            ZZ=GRID(I,J)
            if (ZZ.lt.ZMIS) goto 225
            COUNT=COUNT+1.0
            DIF=ZZ-SUM
            SUM=SUM+DIF/COUNT
            SSQ=SSQ+(1.0-1.0/COUNT)*DIF*DIF
 225 continue
      SSQ=SSQ/(COUNT-1.0)
      SDV=sqrt(SSQ)
      write (LP, 227) IRS, ICS, SUM, SSQ, SDV
 227 format (//5X, 'CORDINATES     ', I6,I6/
     1          5X, 'MEAN            ', F12.5/
     2          5X, 'VARIANCE        ', F12.5/
     3          5X, 'ST. DEVIATION ', F12.5/)
      write (LP,230)
 230 format (/2x, 'LAG    SEMIVARIANCE    COUNT'/)
      write (LF8,234) IRS,ICS,IRS,ICS,SSQ
 234 format (1x,'COORDINATES',2i6,' XY'/':'/2x,2i8,F12.6/':')
      do 255 I=1,MSIDE
         do 255 J=1,MSIDE
            Z1=GRID(I,J)
```

```
         if (Z1.lt.ZMIS) goto 255
         do 245 K=1,MSIDE
            do 245 L=1,MSIDE
               Z2=GRID(K,L)
               if (Z2.lt.ZMIS) goto 245
               X1=float(I)
               X2=float(K)
               Y1=float(J)
               Y2=float(L)
               D=sqrt((X1-X2)**2+(Y1-Y2)**2)
               LAG=int(D)+1
               WLAG(LAG)=WLAG(LAG)+D
               GAM(LAG)=GAM(LAG)+(Z1-Z2)**2
               WT(LAG)=WT(LAG)+1.0
245      continue
255 continue
    ANGLE=0.0
    do 270 I=1,MAXLAG
       WLAG(I)=WLAG(I)/WT(I)
       GAM(I)=0.5*GAM(I)/WT(I)
       write (LP,275) WLAG(I),GAM(I),WT(I)
       write (LF8,275) WLAG(I),GAM(I),WT(I)
270 continue
275 format (2x,f7.2,f12.6,f10.1)
    write (LF8,280)
280 format (':')
300 continue
    stop
    end

    FUNCTION CYNPUT(IN)
**** READS A REAL NUMBER FROM AN 80-BYTE RECORD IN FREE FORMAT
    DIMENSION K(80),NUM(10)
    DATA NUM/1H0,1H1,1H2,1H3,1H4,1H5,1H6,1H7,1H8,1H9/
    DATA INOLD,N,IFL,NPLUS,MINUS,NDOT/0,81,0,1H+,1H-,1H./
    CYNPUT=-0.0
    IF(INOLD.EQ.IN.AND. N.LE.80) GOTO 20
  5 IF(IFL.NE.0) RETURN
    INOLD=IN
    READ(IN,10) (K(I),I=1,80)
 10 FORMAT(80A1)
 15 N=1
 20 IF(N.GT.80) GOTO 35
    DO 30 I=N,80
      II=K(I)
      DO 25 J=1,10
        IF(II.EQ.NUM(J)) GOTO 40
 25   CONTINUE
      IF(II.EQ.MINUS) GOTO 40
      IF(II.EQ.NDOT) GOTO 40
      IF(II.EQ.NPLUS) GOTO 40
 30 CONTINUE
 35 GOTO 5
 40 SIGN=1.0
    IF(II.EQ.MINUS) SIGN=-1.0
    IF(II.EQ.MINUS .OR. II.EQ.NPLUS) I=I+1
    IF(I.GT.80) GOTO 60
    DO 55 N=I,80
      NN=K(N)
      IF(NN.EQ.NDOT)GOTO 70
      DO 45 J=1,10
        KK=J-1
        IF(NN.EQ.NUM(J)) GOTO 50
 45   CONTINUE
```

```
      GOTO 65
50    CYNPUT=10.0*CYNPUT+KK
55 CONTINUE
60 N=82
65 CYNPUT=SIGN*CYNPUT
   RETURN
70 I=N+1
   TENS=1.0
   IF(I.GT.80) GOTO 90
   DO 85 N=I,80
      NN=K(N)
      DO 75 J=1,10
         KK=J-1
         IF(NN.EQ.NUM(J)) GOTO 80
75    CONTINUE
      GOTO 65
80    TENS=TENS*0.1
      CYNPUT=CYNPUT+TENS*KK
85 CONTINUE
90 N=82
   GOTO 65
   END
```